Electrical World and Engineer

THE CONSOLIDATION OF "THE ELECTRICAL WORLD" AND "ELECTRICAL ENGINEER."

VOL. XLVI. NEW YORK, SATURDAY, SEPTEMBER 16, 1905. No. 12.

PUBLISHED WEEKLY BY THE

McGraw Publishing Company

114 LIBERTY STREET, NEW YORK.

TELEPHONE CALL: 7605 CORTLANDT. CABLE ADDRESS: ELECTRICAL, NEW YORK.

EDITED BY T. C. MARTIN AND W. D. WEAVER.

CHICAGO OFFICE.....1139 Monadnock Block
PHILADELPHIA OFFICE.....929 Chestnut Street
CLEVELAND OFFICE.....402 Cuyahoga Building
EUROPEAN OFFICE.....Hastings House, Norfolk St., Strand, London, Eng.

TERMS OF SUBSCRIPTION

United States, Canada, Cuba and Mexico.....Per year, $3.00
Foreign Countries, within the Postal Union.....$6.00
Great Britain and Ireland.....25 shillings
Germany.....25 marks
France.....31 francs
Single copies.....10 cents

Remittances for foreign subscriptions may be made through our European office. Requests for changes of address should be made one week in advance, giving *old* as well as new address. No copies are kept on sale beyond fifteen months from date of issue except in bound volumes.

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Entered as second-class mail matter at the New York Post Office.

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach this office by 10 a. m. Monday preceding date of issue. New advertisements will be accepted up to noon of Tuesday for the paper dated the following Saturday.

The exact circulation of the Electrical World and Engineer each week is stated in this column. Of this issue **13,000** *copies are printed. Total circulation for* 1905 *to date,* **513,000.**

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RADIUM AND THE ORIGIN OF LIFE.

Mr. John Butler Burke, of the Cavendish Laboratory, Cambridge University, contributes to a recent issue of *Harper's Weekly*, a long article giving an account of his researches in certain radioactive phenomena. It is these researches which several weeks ago furnished the occasion of some sensational cablegrams, noted at the time in these columns, to the effect that the Cambridge experimenter had succeeded by means of radium in creating life. The article is polemical in tone, the author predicating possible objections to his conclusions and theories and then proceeding merrily to whack the presumptive (in both senses of the word) critics over the head. The nature of the experiments can be very briefly described. When a radium salt was introduced into highly sterilized bouillon specific nuclei developed after six or seven days, which later ceased to grow and then began to divide and multiply. The growth as pictured in illustrations is gradually from a single nucleus to a two or four-branched body, the several branches finally separating. The article discusses at length the probability of the growth being a form of crystallization or the result of imperfect sterilization, and the conclusion is finally presented that it is "entitled to be classed among living things in the sense in which we use the term." Until Mr. Burke can bring forth the results of experiments which require less argumentation in their interpretation, we fear that most people will remain unconvinced that, with a few milligrammes of radium salt, the great mystery of the origin of life has finally been fathomed.

MODERN IDEAS IN LINE WORK.

The Niagara-Toronto line of which we give a brief description elsewhere, is a capital example of recent principles of line construction. Its performance should go far to settle some of the moot points of design. Of late there have been developed two distinct parties in high-voltage line work. One of these, which we may style the "radical," pins its faith (with steel pins, of course) to the insulator alone, and the chief plank in its platform declares all wooden construction anathema. The other, or "conservative," holds that insulators are desperately wicked and deceitful above all things, and that bringing the full earth potential squarely up into the interior of the insulator is simply inciting it to crime. As happens in larger politics, either party can cite campaign documents without number, and yet when it comes down to business either can put up a safe and successful administration. The line here under consideration is built on the tenets of the radical platform, yet we have no reason to indulge in any gloomy forebodings concerning its success, any more than if it had been constructed on the most rigid Tory principles, albeit it is much easier to criticise a good line than to build one.

The steel tower construction has many good points, especially in the reduction of the number of points at which the high-tension conductor has to be insulated. But it secures these advantages at the cost of absolute dependence on the insulators, which are fairly grounded in the interior all the time. Any failure of an insulator means putting the circuit out of business right then and there. In the Niagara-Toronto line there are two complete circuits carried on the towers, but how cheerful a task it will be to work on a tower with one circuit alive at 60,000 volts is not altogether obvious, even though the tower is grounded. However, in working at 60,000 volt

in the present state of the art one is pretty consistently between the devil and the deep sea anyhow, and must take chances somewhere.

We are particularly glad to have a thoroughly first-class example of tower construction put up in a severe climate for work at 60,000 volts. It will go further toward trying out the merits of the system than a dozen such lines in Mexico or Southern California. We note, too, that the line is a copper line in spite of the theoretical advantages of aluminum—perhaps a concession to climatic conditions, since as a rule aluminum can be had at a slight advantage in price. A temperature ranging from say 50° in winter to 125° or so in the summer sun is quite a different proposition from the comparative uniformity of many southern localities, and the danger from snow, sleet and high winds is of course far greater in Canada than five hundred miles further south.

The precautions taken against lightning are most interesting and look decidedly businesslike. Nobody knows exactly what lightning will do to a line carried on towers. In case of a wooden line it may splinter poles and even cross-arms without a shutdown. Whether it will go harmlessly down a tower without causing the line current to kick over the insulators remains to be seen. The broad principle of the protection, i. e., taking relatively few precautions and those exceedingly thorough, is certainly right. We should much like to see a veracious list of all the shutdowns which have been caused on high-voltage lines by failure of the lightning arresters, not to arrest the lightning, but to hold the line insulation intact. It would be a long and variegated one. Certainly if a grounded wire strung above the line is to be anywhere effective it should be with such a construction as this—a sturdy stranded cable carried seven feet above the tower wires and thoroughly grounded. The arrangement of division houses is exceedingly good, and should have been adopted on many lines that are without it. The convenience of being able to cut out a section of one conductor without disturbing the others is at times most valuable and the value of such a house as a center of observation in caring for the line is very great. The lightning arresters, too, can thus be properly cared for and quickly repaired in case of damage, which is quite impossible when they are scattered promiscuously along the line. We shall be greatly interested in watching the performance of this fine line when it is put to the test of continuous service. It is in a situation where this test will be of unusual severity in nearly every particular, and success will mean the establishment of some very valuable precedents.

Compressed Gas as an Insulator.

Last year Prof. Ryan read a paper before the American Institute of Electrical Engineers upon the voltage required to produce the electric corona around wires in air. In that paper it was shown, as indeed the researches of several laboratories had already indicated, that the rupturing voltage of a given gas layer increased with the pressure of the gas. In later measurements upon the breaking voltage of air under high pressures, using an air-gap of a few millimetres between needle points, it appeared that the breaking voltage increased steadily with the pressure until in the nighborhood of twelve atmospheres, when the curve of voltages with respect to pressure bent out of shape in a most erratic way. This peculiarity manifested itself not only with air, but also with other gases. The source of the discrepancy was finally traced to the spark-gap structure, which was not sufficiently large and remote from the electrodes to leave the course of the dielectric stress undisturbed. When the structure was altered with this phenomenon in view, and thin aluminum rods with rounded ends substituted for needle-points, uniform results were obtained, giving smooth platted curves. A report of the later investigations of Prof. Ryan is contained in a recent issue of *The Electric Journal,* as has been mentioned in these columns.

With an air-gap of approximately 2.5 millimetres or 0.1 inch, the rupturing voltage was about 12.5 kilovolts at normal pressure, or 1 atmosphere, and 70 kilovolts at 14 atmospheres, following a straight-line law between these two conditions. Above 14 atmospheres the effect of increasing pressure becomes markedly reduced, causing the curve to flatten, until at 50 atmospheres it would appear that the rupturing voltage of 111 kilovolts became substantially constant, or was not susceptible of being further increased by increase of pressure. Whether this flattening of the curve is again due to local disturbance in electric flux, or whether it represents a physical limit, it is at present impossible to say with certainty. The results show, however, that the dielectric strength of the particular air-gap used was increased nearly six times by increasing the air-pressure fourteen times. At normal pressure, or 1 atmosphere, the rupturing electric intensity was apparently 5 kilovolts per millimetre, and at 14 atmospheres it increased to 28 kilovolts per millimetre. Consequently the apparent electric strength of the air was raised to that of the strongest rubber insulator, by increasing the air-pressure to 14 atmospheres. There does not seem to be much difference between the dielectric strengths of oxygen, air, nitrogen, or carbonic acid at high pressures, although they are stated to increase by about 18 per cent in all, in the order named. Hydrogen, however, is distinctly weaker. It is hardly likely, therefore, that any of these gases would be substituted for air in attempting to secure high insulation. The advantage to be gained by the substitution would hardly warrant the trouble of the chemical apparatus.

It is hardly likely that compressed air will compete with oil for insulating purposes in connection with high-pressure machinery. It is true that the dielectric strength of oil is only about 6 kilovolts per millimetre; but oil tends to obliterate an arc, and is very conveniently applied to the parts to be protected. On the other hand, compressed air requires a very strong containing chamber for the apparatus, and makes the introduction of the conducting leads difficult. Inspection and repair are also hampered thereby. It would be very interesting to ascertain how liquid air behaves in regard to dielectric strength, by comparison with gaseous air under high pressure. It is not, of course, likely that any important practical use could be made of liquid air for the permanent insulation of apparatus. High-pressure air acts as a high insulator, but it is well known that low-pressure air acts as a very poor insulator. The earliest Edison steam-dynamos, for generating pressures in the neighborhood of 120 volts, had armatures in which the copper bar conductors were insulated by air, over the greater part of their length. When driven at speed, however, these armatures were found to short-circuit internally through the air, probably owing to the low air-pressure or partial vacuum produced in the immediate neighborhood of the armature structure by the rapid rotation. Thereafter it became necessary to insulate the conductors with oiled paper. One direction in which it has been proposed to utilize the increased dielectric strength of high-pressure air is for increasing the potential, and oscillation energy of wireless telegraph antennae. The voltage at the spark-gap determines the energy of discharge, and this can be artificially increased by compressing the air between the spark electrodes.

Some Properties of Alpha Rays from Radium.

Professor Rutherford has published, in the July number of the *Philosophical Magazine,* a very attractive paper containing the results of some recent researches on alpha rays. Radium salts emit

very complex radiations. Not only are they distinct in character, as α, β and γ rays; but the rays of each of these classes also differ in intensity and in penetrating power. It is pointed out that in order to study α rays separately, and under uniform conditions, a very thin film of radioactive material is necessary as the source, because otherwise the rays emitted by the deeper layers become more or less absorbed or attenuated by traversing the superincumbent layers. In order to study the α rays under favorable conditions, a wire made radioactive by exposure to radium emanation was used as the source. A short, thin wire was immersed in a solution containing the emanation from about 20 milligrams of radium bromide and kept negatively electrified. After a time, the wire became intensely radioactive. It was then laid in a support beneath a thin slit in a metallic shield so as to throw a narrow beam of α rays upwards through the slit upon a photographic plate. By placing the apparatus in an exhausted chamber between the poles of an electromagnet, and reversing these poles at intervals, the beam of rays was magnetically deflected from the rectilinear path first to one side and then to the other. With a field of nearly 9.5 kilogausses, the two bands photographed on the plate were found to be dispersed 4.7 mm when the distance from slit to plate was 40 mm. Concordant dispersions were obtained at other distances. From these dispersion measurements, and from the independently observed heating effect of radium, the velocity of emission deduced for the α rays was 0.26×10^{10} cms. per second, or nearly 9 per cent of the velocity of light.

A remarkable fact brought out by the experiments was that the penetrative effect of the α rays ceases very abruptly; that is to says, the rays were found to produce a distinct photographic impression after traversing twelve thicknesses of aluminum foil each 0.0031 mm in thickness, but to be incapable of producing a photographic impression after passing through thirteen thicknesses. That is, the photographic effect was lost between 0.037 mm and 0.040 mm. Yet it is pointed out that the velocity remaining in the α rays at the stage where they ceased to produce the photographic effect was nearly two-thirds of the original velocity of emission. It was also found that the ionising power of the rays, upon gas, ceased at substantially the same range as the photographic power. It was also found that the phosphorescing power of the rays ceased at substantially the same range as the ionising power. From this the deduction follows that the photographic phosphorescing and ionizing power of α rays cease when their velocity has fallen to about 60 per cent of the initial velocity. When, therefore, an α particle falls in velocity to below 0.13×10^{10} cms. per second, or 5 per cent of light-speed; although it still possesses 40 per cent of its initial energy and 60 per cent of its initial velocity, it cannot make its effects visible to the senses either by photographic action, or by phosphorescent action, or by ionising a gas and indirect electric action thereby. An α particle, on the average, is stated to generate about 100,000 ions in gas before it is absorbed, so that the indirect electrical effects produced by the ionization are about 100,000 times as great as by the α particle itself.

Several noteworthy suggestions are offered as flowing from the above experimental results. One is that perhaps the phenomena of phosphorescence and of photographic action due to α rays may be ionisation phenomena. If the alpha-rays fail to phosphoresce as soon as they fail to ionise free molecules in a gas, may it not be that in the fluorescent screen the visible rays emitted are due to ionisation? It is suggested that they may be emitted in the process of recombination after ionic disruption. This is another theory of the modus operandi of the spinthariscope. It is generally supposed that the continual fluorescent lustre observed in this little instrument is due to the rays emitted by the particles of the bombarded substance on the screen when these are subjected to cleavage by the blows of the alpha-ray projectiles. In this paper, however, it is suggested that the cleavage is within the molecule, and that the ions struck out of the molecules may give out heat and light in recombination. Again, if alpha-rays cease to generate perceptible effects when their velocity is still one-twentieth that of light, it is suggested that other substances may also be undergoing slow spontaneous molecular disruption, like radium, and yet we may be entirely unable to recognize the fact, owing to the velocity of the emitted rays being below nine thousand miles per second, so that they are unable to produce any of the recognizable effects of radioactivity. This suggestion opens a wide field for speculation. It is now a widespread doctrine that all matter is of the same fundamental character. In other words, all atoms are aggregations of protyle, the mother substance, and some opine that this protyle is nothing else than electricity. If so, all matter is ultimately composed of electric charges. The forces within each atom that keep its particular atomic structure complete are presumably dynamic forces, just as the forces which keeps our solar system of sun and planets complete are dynamic forces. Each atom is thus a solar system on a liliputian scale. These dynamic forces are evidently stable, or the material forms around us would not be permanent. Yet they may be constantly in fluctuation, just as the earth's distance from the sun in its annual orbit is constantly varying. Conditions are conceivable in a planetary system like ours, when, by a coalition of unusual conditions, a marked perturbation would take place, such as a collision between planets, or a sudden increase in the velocity of one planet which might throw it out of its system, and thus disrupt the same. By the laws of probability such a set of cooperative conditions might occur only once, say, in a trillion planet-years, or planet-orbits. But in a universe containing a trillion such planetary systems, a disruption of this character would be due every year, and yet each system would certainly be stable.

If atoms are microsmic planetary systems of ions, the ion-year must be an exceedingly minute fraction of a second, so that a disruption which might happen in a trillion ion-years would not be so infrequent an accident as human beings measure time. Some consider that radium atoms are liable to occasional disruption, in this way, with the explosive release energy in α, β and γ rays, the subsequent condition of the atom being no longer that of radium; but of some other substance of smaller atomic weight, perhaps helium. The possibility now opens up, as an unverified speculation, that not only radium, but also other atoms, are liable to rare atomic instability, whereby they may disrupt with an explosion of energy and a degradation into atoms of lesser complexity, energy and atomic weight. If the velocity of the projectiled ions is under about nine thousand miles per second, we would be at present unable to perceive the explosions, and we might have to wait for thousands or even millions of years in order to verify the change in physical and chemical constitution. Of these possibilities we seem to have no available evidence. We know that substances seem very slowly to disappear. Metallic objects of great antiquity, as preserved in museums, often seem to have suffered loss of substance, but it is always supposed that simple oxidation or some kind of superficial chemical action would account for the erosion. According to ordinary chemical and physical observations, matter is permanent and does not appear to waste away. It might become possible, however, to add artificially to the velocity of the ions in such cases and thus enable them to attain the critical speed of ionising. Some of the experiments with the ionising properties of very highly heated substances may possibly bear on this point.

Twenty-Sixth Edison Illuminating Convention, at Bluff Point, N. Y.

The twenty-sixth convention of the Association of Edison Illuminating Companies was held this week at Bluff Point, Lake Champlain, N. Y., and was still in session when this issue of ELECTRICAL WORLD AND ENGINEER went to press. The meeting was well attended by delegates from all parts of the country. It is well understood of course that the very nature of the association constituted originally and virtually also to-day of "Edison licensees," forbids that the body should grow at the same rate or attain the same magnitude as the National Electric Light Association, which has 3,500 local companies to draw upon for its members. For this reason a very large attendance for the Edison Association would be a quite small one for the National Electric Light Association, but aside from mere numbers the objects, topics and discussions of the two organizations have become very much alike. Most of the men at Bluff Point, whatever the early limitations of their company, as to nature of service, have to deal with all branches of power supply and illumination; and nearly all of these Edison companies moreover have absorbed or been absorbed by other local companies started merely to do arc lighting, or for alternating-current supply. Now and again the presidents of the two bodies fill both chairs at once, so to speak, and it is rather significant of the close relationships now enjoyed between the two associations that in order to avail of the opportunity presented by the gatherings at Bluff Point of so many of its officials, an executive committee meeting was called there of the N. E. L. A. during the week.

In one respect there is a difference in practice, and that is as to the time of meeting. The N. E. L. A. with its wide scope of membership finds it very convenient to have its annual gathering just at the end of the lighting season, when the winter business is over, and results can be summed up. The Edison body, on the other hand, waits until the fall season of activity has begun, and as one of its members remarked this week, it "usually goes to some nice out-of-the-way hotel whose season is over and helps close it up." But in view of the constitutional limiting conditions it may be doubted whether any much larger gathering could be brought together by a change of date than was actually assembled this week on the beautiful banks of Lake Champlain. A great many of those in attendance arrived some days before the opening of the convention, or else visited the General Electric works at Schenectady en route.

Following its usual practice, the association which began business of Tuesday, held two sessions daily—morning and evening. The meeting was held in one of the large parlors of the hotel and was called to order by President Joseph B. McCall, of Philadelphia, who made some brief appropriate remarks. The rule of the association in sitting with closed doors was adhered to, the wonted care being taken with credentials. Through the operation of this rule a large amount of valuable material and data is in a sense lost each year to the electrical community, but the tradition of the body in this respect seems hard to kill, and a committee was appointed to take the proceedings in hand and see what could be divulged without serious harm to any interest at stake.

On Tuesday morning the reports of the executive committee and the treasurer were presented, showing stable prosperity, and the following reports were also listed by the committees named for presentation and discussion: Meter committee, Alex. Dow, chairman; J. W. Cowles, G. R. Green, A. H. Ackerman, O. J. Bushnell, J. W. Lieb, Jr. Storage battery committee, L. A. Ferguson, Chairman; W. C. L. Eglin, J. W. Lieb, Jr., G. Göttling and W. F. Wells. Lamp committee, J. W. Lieb, Jr., chairman; C. L. Edgar and S. Insull. National Code committee, W. C. L. Eglin, chairman; L. A. Ferguson, T. E. Murray. Steam turbine committee, W. C. L. Eglin, F. Sargent, J. D. Andrews, C. H. Parker, W. H. Norris. Electric heating committee, J. F. Gilchrist, chairman; J. D. Israel, A. A. Pope, C. H. Herrick, W. W. Freeman. These various reports embodied some highly important matters and recommendations, particularly with regard to such points as the new low-watt lamps, the status of the National Code and relations with the underwriters, etc. A paper was read on "The Practical Operation of the Nernst Lamp," by W. T. Morrison, of New York, embodying some of the striking results that have been obtained in the year at such places as Yonkers, Brooklyn, etc.

Tuesday afternoon was given up to the men's handicap at golf and work was resumed at 8 p.m. when the following was the programme: Paper on "The Use of Small-Sized Carbons in Alternating-Current Arc Lamps," by G. N. Eastman, of Chicago. Paper on "A New Rotative Test Meter," by W. J. Mowbray, of Brooklyn. Paper on "Experiences with Tests on All Kinds of Lamps for the Past Year, Including Nernst Lamps," by Dr. C. H. Sharp, of the Electrical Testing Laboratories, of New York, an institution which is under direct control of the Edison Companies. The particular point in mentioning Nernst lamps is not known, but it is understood that the paper touched on many other types, notably tantalum, not only with alternating but direct current, and at high and low frequencies—these conditions apparently explaining some of the inconsistent reports as to the life and behavior of such lamps.

The programme for Wednesday morning embraced the following items: Papers by J. A. Radford, of Chicago, on "Practical Experience with Steam Turbines," giving the Chicago data of operation and by W. L. R. Emmet, of Schenectady, on "Improvements in Steam Turbines," giving the latest results from the standpoint of the manufacturer, the General Electric Company having not only pushed forward the four-stage, large type, etc., but introduced the smaller horizontal sizes. Two papers of a related nature were also presented by Mr. W. F. Wells, of New York, who has lately been made chief engineer of the Brooklyn Edison system. The topics were "Methods of Starting up Large Interconnected Systems Quickly After Partial or Total Shutdown," and "Instruction and Training of All Operating and Construction Men Who Work on High-Potential Apparatus and Connections." A paper was also presented in the joint names of Messrs. Philip Torchio, of New York, and W. C. L. Eglin, of Philadelphia, on "Relative Advantages of 25 and 60 Cycles, Seen from the Standpoint of the Central Station Rather than the Power Transmission System, Pure and Simple."

Wednesday afternoon was given up to entertainment, but in the evening two important items occupied attention. One of these was a paper by Dr. C. P. Steinmetz, of Schenectady, entitled "Magnetite Lamps and Mercury Vapor Arc Lamps and Mercury Arc Rectifiers in Connection with Electric Light." Dr. Steinmetz has of late concentrated a good deal of his work and attention upon what may be termed the elimination and abolition of the time-honored arc light dynamo by the mercury arc system of constant-current transformation and the paper is understood to embody his views as to the fact that all such arc lighters as are now left "must go." The other parts of his paper as to vapor lamps and magnetite lamps were equally interesting, several circuits of both types having been installed. Mr. J. W. Lieb, Jr., the retiring president of the American Institute of Electrical Engineers, whose brilliant work did so much last year to make the "circular tour," the visit of European friends and the St. Louis exercises a success, read an admirable summary or paper on "The International Electrical Congress at St. Louis," in one part of which he gave special prominence to the papers and discussions relative to lighting and other central station problems.

But one—a morning session—was listed for Thursday, when to the long string of useful papers, etc., already presented, the following were added: Paper on "Coal Handling and Storage of the Edison Electric Illuminating Company, at the South Boston Station." It will be remembered that the general plant has been fully described in these columns. Paper on "Notes on Sales of Electric Power," by E. W. Lloyd, of Chicago; paper on "The Relation of the Central Station to the Motor-Driven Refrigerating Machine," by G. W. Goddard, of Philadelphia. Paper on "The Relative Merits of Discharging Batteries in Edison Systems Through Reversible Boosters and Through End Cell Switches," by Gerhard Göttling, of Boston.

The officers of the association for the current year 1904-5 are: President, J. B. McCall; vice-president, D. L. Huntington; treasurer, Alex. Dow; secretary, E. A. Leslie (deceased), and H. C. Lucas, assistant secretary. Mr. Lucas had his office established as an annex to the meeting room for the convenience of members and visitors and thanks are due him for many courtesies extended.

It is the exception rather than the rule for any exhibits to be made at an Edison convention, but one was made this year by the General Electric Company in the basement of the hotel of its two types of electric heating apparatus, the Lynn and Schenectady; the newer forms having the heat wire embedded in a quartz substance. The company was well represented and as usual extended many courtesies to the delegates, including a tally-ho ride for the ladies on Tuesday afternoon. The company's officials on the spot were Gen.

Eugene Griffin, first vice-president; Mr. E. W. Rice, Jr., third vice-president; Mr. J. R. Lovejoy, general manager of the lighting department; Dr. C. P. Steinmetz, chief engineer; Mr. J. R. McKee, manager power and mining department; Mr. B. E. Sunny, western manager, and Messrs. W. L. R. Emmet, G. E. Gilbert, C. D. Haskins, F. H. Gale, H. W. Hillman and P. D. Wagoner, of Schenectady; C. B. Davis and F. M. Kimball, of Boston; T. Beran and F. C. Bates, of New York; John W. Howell, F. R. Willcox and G. H. Morrison, of Harrison, N. J.

Among others participating in the convention were Mr. Wilson S. Howell, of the Electrical Testing Laboratories; Mr. Chas. Blizard, sales manager of the Electric Storage Battery Company; Mr. B. H. Scranton, president American Electric Heater Company; Mr. Max Loewenthal, Prometheus Electric Heating Company; Mr. T. C. Martin, ELECTRICAL WORLD AND ENGINEER, and Mr. Converse D. Marsh, conductor of the "campaign of publicity" for the Chicago and Boston Edison Companies.

The entertainment programme included on Wednesday afternoon a special trip of the whole covention to the Clinton County Fair at the adjoining town of Plattsburg. A special excursion was given by Mr. and Mrs. Joseph McCall on Thursday to the famous scenic resort, Ausable Chasm, with which the meeting may be said to have terminated.

The total attendance of delegates at the convention reached a figure before its close of probably 150. Among the member companies represented were the New York Edison by Messrs. Murray, Lieb, Pope, Littlefield, Ackerman, Morrison; the Boston Edison by Messrs. Herrick, Hale, Marsh, Göttling; the Chicago Edison by Messrs. Ferguson, Holmes, Gilchrist, Lunn, Junkersfeld, the Philadelphia Edison by Messrs. McCall, Johnson, Eglin, Lucas, Israel; the Brooklyn Edison by Messrs. Freeman and Wells; E. H. Davis, Williamsport, Pa.; J. H. Perkins, Wilkesbarre, Pa.; N. V. N. Powelson, St. Louis; Capt. Wm. Brophy, Boston; Harry Bottomley, Fall River, Mass., and G. W. Brine, Atlanta, Ga. Other well-known representatives were Messrs. Dow, Stetson, Price, Post, E. B. Greene, Kielholtz. The absence of Messrs. Insull and Edgar, who have been abroad for some months was much regretted.

Reorganization of the American Street Railway Association.

The following embodies the contents of an important circular just issued to the members of the American Street Railway Association by President W. Caryl Ely:

The proposed constitution for the new body provides that its name shall be the American Street and Interurban Railway Association, with headquarters in New York City. Its objects will be those which have characterized the association in days gone by, but are set forth somewhat more explicitly. The membership is to consist of two classes, active members, which are to be American street and interurban railway companies or lessees or individual owners. Each member is entitled to one vote cast by a properly accredited delegate. The second class consists of associate members, including individuals who are or have been at some time actively identified with street and interurban railway interests, and other persons who, in the opinion of the executive committee, have had experience rendering them desirable for membership. Such associate members will have the general privileges, but will not be entitled to vote nor to speak unless expressly permitted. The fees for associate members are annual dues of $5. The fees for active members are based upon gross receipts, and an admission fee of $10. The scale of gross receipts runs from $25 for under $100,000 up to $600 for gross receipts of over $10,000,000 there being eight different groups. The officers are to consist of a president, vice-presidents, equal in number to the number of affiliated associations, a treasurer and a secretary, all of these being elected at the annual meeting by ballot and by a majority of the votes of all present, excepting the secretary, who is to be the appointee of the executive committee, and is to be paid a salary.

The meetings are to be held annually between September 15 and December 15, and a committee on subjects is to be appointed each year to organize a programme. All papers read must relate to the objects of the association and have the approval of the executive committee.

A special section, devoted to affiliated associations, is as follows:

XII. This association shall do all in its power to promote the welfare of other associations organized with its approval to investigate technical matters connected with street and interurban railway construction and operation. To this end it will, in the following way, and in others which may be determined by the executive committee, assist in the work of such affiliated associations:

(a) By granting charters to and approving the constitutions of such associations.

(b) By admitting to the executive committee a member from each of such associations.

(c) By granting financial assistance to such associations for specific purposes.

(d) By editing, printing and binding the reports of the proceedings of such associations.

(e) Through its secretary and committee it will assist in arranging for conventions, suggesting suitable subjects for investigation; it will file information for reference and distribution and in every way endeavor to stimulate interest in all of the affiliated associations.

It will be remembered that the last annual convention at St. Louis devoted considerable time to the consideration of questions relating to a more complete and perfect organization of this association and the various associations affiliated with it in street and interurban railway work, and that all matters and things concerned in bringing about said objects were committed to your executive committee with power to act. Pursuant to such action your executive committee entered upon the work so delegated to it, and, as you have been heretofore advised, held a meeting at the Holland House in New York City upon the third and fourth days of February, 1905. At such meeting there were present representatives of all affiliated organizations, and a committee to prepare a plan of reorganization was appointed, consisting of the undersigned, as chairman, and the following members: For the American Street Railway Association, E. C. Foster, New Orleans; Richard McCulloch, St. Louis; C. G. Goodrich, St. Paul; W. E. Harrington, Camden, N. J. For the Accountants' Association, W. G. Ross, Montreal, and Frank R. Henry, St. Louis, alternate. For the Mechanical Association, H. H. Adams, Baltimore, and E. W. Olds, Milwaukee, alternate. For the Claim Agents' Association, W. A. Dibbs, New York, with W. H. Renaud, New Orleans, alternate. For the Manufacturers' Association, W. H. Heulings, Jr., Philadelphia, and William Wharton, Jr., Philadelphia, alternate.

The committee determined to have a thorough examination and study made of the scope, plans and methods of work of the more prominent organizations of similar character throughout the country. Professor Henry H. Norris, of the Department of Electrical Engineering at Cornell University, was selected for that part of the work, and he at once entered upon it. He made a most complete and thorough investigation and a comprehensive and admirable report. Professor Norris' report was based upon a careful study of practically all of the similar organizations in the United States and Canada, and embraced an extensive digest of the constitutions and methods of work of the following: 1. American Street Railway Association; 3. American Railway Mechanical and Electrical Association; 3. American Association of Street Railway Claim Agents; 4. Street Railway Accountants' Association; 5. New York State Railway Association; 6, American Railway Association; 7. American Railway Engineering and Maintenance of Way Association; 8. Master Car Builders' Association; 9. American Railway Master Mechanics' Association; 10. International Tramways and Light Railways' Association; 11. American Association for the Advancement of Science; 12. National Electric Light Association; 13. American Bankers' Association; 14. New York State Bankers' Association.

In analyzing the methods of procedure of the various associations their work was divided into the following sections: (a) Object, (b) means of attaining same, (c) members, (d) privileges of same; (e) officers, (f) meetings, (g) lines of work undertaken, (h) dues.

Professor Norris' report was voluminous, embracing nearly 150 printed and typewritten pages. A very complete digest of the same was made and printed. The report was considered at a joint meeting of representatives of the affiliated associations held at the Hotel Bellevue-Stratford, Philadelphia, Pa., on the 12th and 13th of June, 1905, at which meeting there were present the

following members of the joint committee: For the American Street Railway Association, President Ely, Mr. John J. Stanley (in place of Mr. E. C. Foster), Mr. John I. Beggs (in place of Mr. Richard McCulloch), Mr. C. G. Goodrich and Mr. W. E. Harrington. For the Accountants' Association, Mr. W. G. Ross. For the Mechanical Association, Mr. H. H. Adams. For the Claim Agents' Association, Mr. W. H. Renaud. For the Manufacturers' Association, Mr. Wm. Wharton, Jr. There were also present the following named gentlemen: Messrs. John B. Parsons, John Grant, C. C. Pierce, James H. McGraw, E. H. Baker, D. M. Brady, H. W. Blake, Samuel Curwen, H. J. Kenfield, E. M. Williams, George Keegan, Newcomb Carlton and Professor H. H. Norris, of Cornell University.

The report and the draft of form of proposed constitution and by-laws accompanying the same were carefully gone into and discussed at great length, and finally read section by section, and freely amended.

The constitution and by-laws were adopted as amended and recommitted to a sub-committee for revision, and have been by it carefully revised, submitted to counsel, and finally approved and printed, and are herewith submitted to each member of the association.

They have been issued to the technical press to insure the widest publication to all interested in street and interurban railway work, and through the membership committee, of which Mr. H. H. Vreeland is chairman, a copy will be sent to every non-member company, together with a letter setting forth the increased advantages of membership which will be afforded by the reorganized association and its affiliated organizations. They will be brought up for final action at the coming convention to be held at Philadelphia on the 27th and 28th of September, 1905.

Concerning the writer's views it may not be inappropriate at the present time to quote from the President's annual address delivered at the last convention. He said in part: "A careful inspection of the proceedings of the conventions of the last few years reveals the fact that most of the time of each convention has been occupied with the reading and discussion of papers embracing subjects which, for the most part, relate to the small technicalities of the business, and nearly all of which might have been profitably committed to proper auxiliary and subsidiary organizations. Broad fields of co-operative effort in the most important lines of our work have remained almost untouched. It becomes immediately apparent upon investigation and discussion of the situation that we might profitably enter upon the discussion of the greater questions affecting our welfare. The confusion of laws throughout the country affecting our corporations is a matter to which we might well devote attention. There are also such great questions as taxation; municipal ownership of street railways; franchise rights and obligations; statutory laws affecting our class of companies; municipal laws and ordinances, and other questions of importance to which your minds will readily refer. The collection and preservation of data tending to throw light upon the problems of great importance that confront us is also a matter deserving of attention, and in this regard it would seem that through the medium of the secretary's office and of appropriate standing committees an invaluable collection of data could be made and permanently preserved in such form as to be conveniently accessible to any member of the association upon merely making request of the secretary. If the work of the secretary's office should be made continuous there would thus grow up in time a vast repository of valuable statistical and historical information, readily available as a matter of right to every member. This branch of the work alone, if properly prosecuted, would render membership in this association so valuable that it is difficult to understand how any street railway corporation would feel justified in remaining outside of this association."

Some of the more important advantages to accrue from the proposed reorganization, as stated by Professor Norris, are: (1) The Information Bureau.—The function of this bureau will be to supply such information as follows: (a) Statistics regarding electric railway construction, maintenance and operation; (b) general information regarding various electric railway properties; (c) information regarding statutes affecting electric railway construction and operation in various localities; (d) advice as to the practicability of new appliances, looking toward the establishment of a testing bureau, if such be found desirable; (e) scientific information along lines allied to electric railway work. (2) The investigation of general problems affecting the relations of electric railways and the public, e. g., municipal ownership at home and abroad, franchises, taxes, etc. (3) The investigation of technical problems, such as the utility of new fuels, new prime movers, new motors, new sytsems of transmissions, new signal systems, etc. (4) The distribution of important information among the members by means of regular and special bulletins. (5) The arranging, binding and distributing of the volumes of proceedings of the association, including the indexing and general supervision of printing, proof-reading, etc. (6) The arranging of the details of conventions. This will relieve the president and executive committee of much detail work, and will enable the association to do a large amount of investigation by means of special and standing committees.

Brooklyn Rapid Transit Annual Report.

The report of the Brooklyn Rapid Transit Company for the fiscal year ending June 30, 1905, has just been made public. It reviews briefly the general condition of the property, and notes additions and improvements that have been made during the past year. The latter extend to all departments of the company. Of particular interest is the statement that there have been added to the equipment 100 new elevated motor cars and 87 convertible surface cars, and that a further addition of 100 elevated and 114 convertible surface cars are to be received within a few months. Still another item of interest is the reference to the new Williamsburg power station building, which really is an extension of the company's eastern district station on Kent Avenue. This station is designed for the ultimate capacity of 100,000 kw. There is now being installed in the station one 7,500-kw turbo-unit and one 5,500-kw turbo-unit. These, it is expected, will be ready for operation by the end of the year. A third unit of 7,500 kw capacity will be installed during the summer of 1906. The power equipment has been further augmented by an increase in the equipment of the Tompkins Avenue, Brooklyn Bridge, Essex, Coney Island and Parkville sub-stations, and a new sub-station has been erected on Myrtle Avenue near Broadway.

The operating statement shows that the gross receipts were $16,333,444. Charging off against this operating expenses of $9,803,870, there is left as net earnings from operation $6,529,574. Income from other sources, of $252,135, brings the total income up to $6,781,709. As taxes and fixed charges amounted to $5,178,491, the net income is $1,603,218. Out of this sum was taken for betterments and additions to property $453,284. This leaves the surplus for the year $1,149,933. Adding to this the surplus of June 30, 1904, of $1,594,189, the surplus to June 30, 1905, is $2,744,123. Charged off against this is the sum of $1,795,400 for adjustment of supply accounts and for discount on bond sales. This makes the balance surplus as of June 30, 1905, $984,723.

Accident on New York Elevated Railway.

Twelve persons were killed and 42 injured a few minutes after 7 o'clock Monday morning, September 11, by the fall of a car of a southbound Ninth Avenue train from the elevated railroad structure at the curve at Fifty-third Street and Ninth Avenue, New York. The train, running at high speed, took the switch at Fifty-third Street, which it seems was set by mistake for a Sixth Avenue train. The first car cleared the curve, but the second slewed around and was torn off its trucks, falling into the street. As the car fell it turned completely over, and its forward platform struck the sidewalk with a crash. The rear platform remained suspended against the framework of the elevated road. The trucks of the third car were hurled from the track through the bottom of the second car and the first and third cars came together with a crash. The car which had been thrown from the structure remained suspended at an angle of 45°, and the passengers in it were hurled to the forward end, some being killed instantly and the others injured more or less seriously. The third car of the train, pushed forward by the weight of those behind it, was shoved over the elevated structure and its forward end was forced through the window of a dwelling on the corner. This car finally settled, its forward end, held by the sill of the window and the fire escape, hanging suspended like a bridge across the intervening space.

An examination was made by the officials of the company soon after the disaster, and it was found that on the first car of the train the signals were set for Ninth Avenue. On the other hand, the switchman claims the car signals were those of a Sixth Avenue train, and he set the switch accordingly. The Coroner and the officials of the road are said to agree that Motorman Kelly should in any event have seen that the tower signals were set for Sixth Avenue, and as he was running a Ninth Avenue train should have stopped until he got the proper signals to proceed down Ninth Avenue.

This is the first accident which has occurred on the New York Elevated road causing loss of life to passengers through no negligence of the latter.

Trolleys and Finances

The continuous and striking development of trolley systems, etc., and the need for new money in their development is thus noted by the *Wall Street Journal*:

Fourteen corporations either operating street railways or connected therewith directly have taken from the Wall street market in the four months ending September 1, nearly $48,000,000 of cash. The total does not include the dozens of small railways in various districts which have come to the New York underwriters for small amounts of cash for extensions, etc.

The list is bigger than for the four months ending May 1. While the steam railways have checked their financing, the street railway industry seems to have taken a new lease of life. There was but one item of importance in the street railway underwriting of the first third of the year, while the second third brought four items of $5,000,000 or over. The list is as follows:

Brooklyn Rapid Transit	$1,000,000
Consolidated Railways of Connecticut	1,000,000
Detroit United	6,585,000
Havana Electric	5,000,000
Interborough	10,000,000
International Traction	1,000,000
Indianapolis & Southeastern	1,000,000
Philadelphia & Western	1,600,000
St. Louis Transit	1,000,000
Street Car Consolidation	11,000,000
South Side Elevated	2,500,000
Toledo & Western	2,500,000
United Railways of Baltimore	1,000,000
West Penn	2,500,000
Total of street railways	$47,685,000

It will be noted that the biggest item is the $11,000,000 for the organization of the Street Car Trust. This is but part of a bigger capitalization in stock. The underwriters have supplied the cash to combine practically all the big manufacturers of street cars, along the lines followed by the steam railroad equipment consolidations in 1900-1903. This is an important development, with its principal bearing, so far as Wall street is concerned, in the fact that the street car business is now regarded by financiers as so far assured that it warrants a combination of this kind. It is but a few years since the electric street railway industry in this country was experimental.

Brooklyn Rapid Transit is credited unofficially with an additional $2,000,000 of bonds. The item listed is official. In the first quarter the company issued nearly $6,000,000 of its refunding bonds to the $1,000,000 in the second period. The Interborough kept up the reputation of New York city tractions for spending money by the issue and sale of the $10,000,000 of notes to pay for extensions. The big issue of Detroit United bonds was largely in the nature of refunding.

The French Cable in Venezuela.

Confirming previous advices, the State Department at Washington has been informed by Minister Russell, the American diplomatic representative to Venezuela, that the Venezuelan Government has closed the French Cable Company's offices at Caracas and at all other points in Venezuelan territory. Accordingly it has become necessary to send telegrams from Caracas to La Guaira over the Government cable line. At La Guaira they can be sent to another cable line for the transmission of a message between Caracas and La Guaira, a distance of but twelve miles. The Venezuelan Government has established a rate of 20 cents per word. Government officers here are inclined to think the rate exorbitant, and that the Government of Venezuela, having an exclusive line, is playing a hold-up game.

As soon as the news that the French company's offices have been closed and the property seized reaches Paris it is thought here that France will make representations to Castro. The case of the French Cable Company is similar to that of the New York & Bermudez Asphalt Company. The Government maintained that the cable company was guilty of non-fulfillment of contract by failing to construct certain lines. The case was taken to the courts. It quickly passed through one and was appealed to another. Up it went to the highest court of the country, and at the end the concession of the company was canceled.

When the first decision annulling the concession was made France was considerably stirred up. At that time the French Minister made forcible representations to the Venezuelan Foreign Office. President Castro had withdrawn to the mountains and refused to receive any diplomats. French warships were sent to Caribbean waters to be close at hand. The two cruisers were placed at the disposal of the French Minister at Caracas and France was fully ready to take action against Venezuela.

French property has now been actually seized by the Venezuelan Government, and in view of the French belief that the company has been unjustly dealt with, action is likely to be forthcoming soon. President Castro has been preparing for trouble. Recent reports from Venezuela indicate that he has made large purchases of arms and ammunition, coast defense and mountain guns. If the French Government desires to use force in making Venezuela return the property of the cable company it is not likely that the American Government will protest or interfere.

Since the above was written, a cable dispatch has been received from Caracas of September 7 as follows: The following Governmental decree was issued to-day: "Whereas M. Brun, manager of the French Cable Company, has protested before the national Government against the decree closing the overland and coast offices of the company, and whereas this action shows that M. Brun is ignorant of the laws of the republic, the president decrees that the said M. Brun be expelled from the territory of the republic." M. Brun has left.

American Patents in Germany.

In a letter to Consul-General Mason, of Berlin, Mr. Robert Grimshaw dwells upon the importance to Americans of taking out German patents on inventions which some time may form part of manufactures exported to Germany. In the first place, patenting in Germany prevents the foreigner from doing what he has otherwise every legal right to do at any time that he sees that a foreign invention is meeting with success—and possibly success at his expense, in that it is being sold in his territory and supplanting his own products, viz.: make and use it.

Of perhaps great importance is the assistance rendered to the selling agent. A prospective customer does not want to buy a lawsuit with a machine or other purchase. In case the article to be sold is not patented in the country in which it is offered for sale there is the danger that it has already been patented by another, and that the patentee will very justly bring against the purchaser an action for infringement of his chartered rights. In this danger the resident agent—the missionary—participates. It is useless to assure the customer that the manufacturer is one of the largest concerns in his native country, and will protect the purchaser against any possible suits for infringement. In the first place the customer has no means of verifying the statement about the financial weight of the manufacturer, and in the second he does not care; he does not wish to be annoyed by any suits, no matter how heavily he may be backed up. In the third place, if he knows any thing about German patent law, and the case is a German one, he will quietly remind the missionary that in that country the infringement of a patent is not merely a civil but a criminal offense; and no manufacturer in America, however influential in financial circles, can get around that part of the difficulty. Section 36 of the German patent law of April 7, 1891, says: "Whoever knowingly uses an invention contrary to the ordinances in sections 4 and 5 will be punished with a fine of 5,000 marks or with imprisonment not to exceed one year." The quoted sections 4 and 5 are those which secure to the inventor the sole rights of the invention which he patents.

Further, there are many manufacturers who seek to convey to their agents and to the customers the impression that the matter is patented in the country of sale, not by directly saying so but by impli-

cation. Sometimes this implication is only one of silence; but for all that the attempt, whether unlawful or not, is dangerous in most countries, and especially in Germany. For section 40 of the law, already quoted, says distinctly that whoever marks objects or their packages with any sign calculated to impress one falsely with the idea that the object is patented according to the German law shall pay a fine of 1,000 marks.

Value of Membership in the American Street Railway Association.

In a recent circular sent to the street railways of the United States not now on the roll of the American Street Railway Association, Mr. H. H. Vreeland, chairman of the membership committee of that body, points out the value to even the smallest roads of the association as recently broadened in scope.

The change to electricity as a motive power for street railways, in conjunction with other improvements in the industry and with the general progress of the times, has, it is stated, resulted in a wide expansion of traction facilities in cities and a vast extension of suburban and interurban lines. This has in turn resulted in a readjustment of the attending conditions, with an ever-increasing demand for information relating to the methods used and results obtained in conducting departmental work, and for statistics concerning investigations made in the interests of electric railway companies. Among the new features of importance introduced into the association is a Central Bureau of Information, for the collection of valuable data relating to various phases of the industry, and for the circulation of this information among members.

While the companies of greater mileage, for years past, have been accumulating information of such value along specific lines, the bureau will promote a more general interchange of such data between these companies than has been practicable up to the present time. It is also proposd to engage in active investigations of such questions as taxation, franchise rights, municipal ownership, accident claims and statutory and municipal laws affecting electric railway companies. The accumulation of data regarding these problems will be immediately available to all members of the association. The companies with greater mileage will thus be relieved of the constant inquiries by the companies with lesser mileage, and the information thus received, through the secretary's office, will be of the highest value to the latter. While the companies with lesser mileage can least afford to make experiments, they also can least afford to make mistakes. Although they may not be as vitally interested in municipal ownership, statutory laws, taxation and accident claims as are the companies with greater mileage, there will be available to them a large fund of information resulting from the long practical experience of such companies.

CURRENT NEWS AND NOTES.

MUNICIPAL ELECTRIC LIGHTING.—By a blunder of the printer of the advance copies of the papers read before the recent meeting of the International Association of Municipal Electricians, a paper by Mr. A. S. Hatch, of Detroit, on "Municipal Ownership" was made to appear as a continuation of a paper by Mr. Louis Gascoigne on "Underground Construction." In our abstract of the proceedings of the meeting this error led to the omission of the name of Mr. Hatch, credit being given to Mr. Gascoigne for treatment of both subjects.

ELECTRICALLY-DRIVEN FIRE ENGINES.—It is announced in the *Zeitschrift für Elektrotechnik* that two fire engines and a car for carrying accessory appliances, all electrically driven, have recently been put into service by the Vienna fire brigade. The accumulators, which, it is said, are sufficient to propel the car for some 28 miles at a speed of 12½ miles per hour, are placed in a compartment in front of the driver's seat over the front wheels. India rubber tires 125 mm. (4.9 in.) thick, are fitted to the wheels, which are 850 mm. (2 ft. 9½ in.) in diameter. Each of the front wheels is provided with a 35-hp Lohner-Porsche hub motor. The controller provides for the following speeds: 5.6, 6.8, 12.5, 17.4 and 22.4 miles per hour.

AMERICAN RAILWAY MECHANICAL AND ELECTRICAL ASSOCIATION.—The third annual convention of the American Railway Mechanical and Electrical Association will be held at Philadelphia September 25 and 26, in conjunction with the convention of the American Street Railway Association. Following is a list of the papers and reports that will be presented at the sessions: "Power Distribution," by C. H. Hile, Boston, Mass.; "The Power Station Load Factor as a Factor in the Cost of Operation," by L. P. Crecelius, St. Louis, Mo.; report of the committee on Controlling Apparatus, chairman J. S. Doyle, New York, N. Y.; report of the committee on Welding of Rail Joints, chairman F. G. Simmons, Milwaukee, Wis.; report of the committee on Maintenance and Inspection of Electrical Equipment, chairman William Pestell, New York, N. Y.; "The Power House," by Fred N. Bushnell, Providence, R. I.; "The Track Brake," by F. F. Bodler, master mechanic, the United Railroads, of San Francisco, Cal.

AMERICAN MACHINERY IN RUSSIA.—The Czar of Russia has ordered the discontinuance of the special levying of extra duties on American products. The customs duties referred to grew out of the imposition early in 1901 by the American government of a differential duty on Russian sugar imported into the United States. Following this action an order of the Russian Minister of Finance imposed maximum duties on certain American articles, the increases ranging from 20 to 30 per cent. Generally stated, these articles were cast-iron wares, manufactures of iron and steel, iron and steel boilers, tanks, bridges, pipes, etc., machinery, sewing machines, meters, dynamos, electric motors, portable engines, locomotives and locomotive cars, automobiles and fire engines. The retaliatory duties on American goods in Russia have been heavily felt by American manufacturers, especially those making agricultural implements and machinery. The high duties on these American products have had the effect of giving German and English manufacturers an uncontested market in Russia. The change will be decidedly advantageous to this country.

LIGHT AND THE DRAMA.—Mr. Augustus Thomas, the playwright, in a recent interesting interview, spoke of the "greater disposition to naturalness" in modern plays, and when asked to what he attributed this, said: "To the improvement in the playhouse itself, and very noticeably to the introduction of electrical lighting. In the olden days when the theatres were lighted by candles the facial expression of the actor must have been more difficult to see, and his meaning had necessarily to be bolstered by additional speeches, by a greater prolixity. There was a gradual diminution of this prolixity as in their turn oil and gas and electricity secured a greater illumination. Facial expression became more evident and verbal expression correspondingly abridged." "Has this resulted only in the abridgement of the lines?" "No, I think that there has been an introduction of more delicate shades of meaning in the lines of the ordinary comedy. It is quite possible for a dramatist to write a speech which he shall intend the facial play of the actor to absolutely contradict. The modern comedy has become more delicate, more intimate and more insinuating."

BUZZERS AND RIBBONS.—A visitor from Massachusetts to Manhattan is described by the New York *Sun* as denouncing the use of the "buzzer" in windows for calling attention thereto, and as saying: "In Springfield you will notice in many of the stores on Main Street a device for attracting the attention of passersby to the stock displayed in the windows in a pleasing manner that is calculated to draw purchasers, not repel them, as these window buzzers do. To the center of an electric fan long streamers of ribbon are fastened, sometimes all white, sometimes in tasteful combinations of colors. When the fan revolves these streamers float out over the goods in the window, fluttering in the swift currents of air and waving in graceful, ever-changing hues. The effect is one of coolness, and stopping a moment to enjoy it on a hot day, one is much more likely to feel drawn to enter and buy than if a wicked little buzzer mocked at his tired nerves. It is especially effective in a wndow filled with nice candies and backed by a cool fountain of summer drinks." The streaming ribbons are a very old device, too, in New York City, and were probably seen in its store windows in the earliest days of the fan motor.

FRENCH CABLE IN VENEZUELA.—At Caraccas, on September 5, pursuant to the judgment dissolving the contract of the French Cable Company, a presidential decree closed the coast and overland offices of the company, which remains in charge only of the La Guayra office for dispatches relating to foreign business.

ANOTHER ATLANTIC CABLE.—The Commercial Cable Company's new cable from Canso, Nova Scotia, to Port Au Basques, Newfoundland, has been completed and was opened for business September 11. This gives the Commercial Cable and Postal Telegraph system connection with all points in Newfoundland by direct communication.

SERIOUS LIGHTNING EFFECT.—Special dispatches from Richfield, Utah, state that one man was killed outright, one fatally injured, and a score of others seriously injured by a bolt of lightning which struck in the centre of a crowd of 1,200 persons who were watching the horse races at the Richfield Fair. More than 200 persons were thrown to the ground, and most of them were insensible for several seconds.

FIRE AT NIAGARA FALLS.—A fire which started on the night of September 9 in the wire tower of the Niagara Falls Hydraulic Power Company left half the city in darkness, owing to destruction of the power conduits. The plant of the Pittsburg Reduction Company was damaged to the extent of about $10,000. The damage to the power company's plant will be heavy. Owing to the position of the buildings on the edge of Niagara River, down in the gorge, the firemen were unable to fight the flames effectively for some time.

GOLD DREDGES IN ALASKA.—For the electrical operation of gold dredging boats on Alaskan rivers a power house, which will be located at Dawson City will be equipped with a 400-kw generator, operated by a 600-hp steam turbine. Lines for transmitting this power, says the *Iron Age,* will be strung from the station to wherever the dredges may be operating on the Yukon and its tributaries. On the boats will be installed induction motors of an aggregate of about 500-hp, in sizes ranging from 7 to 100-hp each.

LONDON MUNICIPAL TROLLEYS.—A cable dispatch from London of September 9 says: "The London County Council has just concluded a deal by which it takes over the North Metropolitan Tramways Company for a total payment of $2,000,000, including right of way and rolling stock. The surrender of the lines will take place next March. The lines to be transferred from the North Metropolitan Company are 48¼ miles in length, and, together with the southern system of 46 miles at present worked by the Council, will give that body a combined tramway mileage of 94¼ miles. The present transaction will make the Council master of virtually all the tramways in the county area."

ELECTRIC SHELL HOISTS.—Bucket dredger shell hoists in the ammunition passages are a novelty that has been fitted to the English battle ship King Edward VII, reports the *Iron Age.* These hoists are operated by electric motors, upon the same mechanical principles as marine dredges. The difference in detail is that the bucket is halved, and consists of a bisected steel cylinder, slightly larger in diameter than the shell. A pedestal is fitted on the ammunition passage flat, which is geared to the electric motor, and the base is exactly fitted to receive the bottom of the shell. Directly the shell is placed in position steel clips attached to the half buckets retain it there, and by means of an endless chain and recurring buckets a constant supply is delivered to the gun crews. Hand gear is provided, for use in case the electric gear should become disabled.

DUNNE A JELLYFISH.—The "municipalites" of Chicago have agreed to differ among themselves, and war is on. A special telegram from Chicago of September 9 says: "The storm in the Municipal Ownership League broke over Mayor Dunne's head to-day, when T. P. Quinn, president of the organization, declared that his honor had abandoned municipal ownership. Mr. Quinn calls on all real friends of the movement to defeat Mayor Dunne's latest plan. The league will hold a referendum on the plan next week, and those who favor straight municipal ownership, as against granting a franchise to a corporation, will endeavor to defeat the Mayor and his advisors. Mr. Quinn flayed the Mayor for being recreant to the voters in not carrying out his ante-election pledges. In describing the man he helped to elect, Mr. Quinn referred to him as a "jellyfish," a man without nerve, and declared that he had proved his incapacity by his failure to push real municipal ownership of the street railways, instead of compromising on a plan which practically continued private control of the traction lines."

ENGLISH MUNICIPALISM.—An item in the *London Daily Mail* gives an insight into the feelings of the taxpayers about the results of municipal ownership, in the following item: "A conference of 140 delegates from ratepayers' committees and associations in all parts of London met in the Peckham Town Hall last night to decide on united action in regard to municipal extravagance. The speakers had a monotonous story to tell of distress through high rates and of unbusinesslike management of local affairs. Some were in favor of petitioning the Government to limit the rates. 'It's our own fault as ratepayers,' others said. 'We elected the spendthrifts. We must bear with them until we turn them out.' Organization in the boroughs and a revision of the methods of keeping borough accounts were agreed on as lines of action. 'We want nothing to do with politics. We want our boroughs run as business concerns,' emphasized one delegate, and his declaration was cheered vigorously." Another *Mail* item states that the year's profits of the large tramway system of the Cardiff Corporation were $100.

THE TALE OF THE TICKER.—According to the *Wall Street* Journal people everywhere are more interested to know the state of the stock market than to be informed as to the weather outlook. "The tape rolls from the stock ticker continually into the waste paper basket, that receptacle which, more than anything else on earth, is symbolic of utter worthlessness. Yet this narrow ribbon of paper on which a few cabalistic characters are printed may almost be said to rule the business world during its brief journey from ticker to basket. Its life is short measured by time, but long measured by the standard of achievement. It only records by a system of shorthand, all its own, the transactions of the stock exchange, and these transactions do not all represent actualities. Taking one month with another, a third of the sales recorded by the tape are probably manipulation, a third are the exchanges of the room traders, leaving only one-third as the sum of the buying and selling that stands for real transfers of securities. But even so, the expert Wall street man can often read in the abbreviations on the tape not only the history of the day's speculation, the play of force against force, the plot of the manipulator, the hopes of the bulls, the fears of the bears, the folly of the lambs, but even more than that the history of the times, the profits of commerce, the yield of crops, the ambitions of kings, the fate of cabinets, and the chances of battles."

TROLLEYS FOR LONG ISLAND.—The Long Island Railroad Company has been erecting poles all along the lines of its right of way between Jamaica and Mineola and up the Oyster Bay line to Glen Cove for the support of the feed wires which will transmit electricity from the power house in Long Island City for the short electric line owned by the company at Sea Cliff and for the new line being built at Glen Cove from the landing to the station. There will be a sub-station built at Mineola, and in the near future the third rail will be extended from Belmont Park, five miles beyond, to Mineola, and from there to the north, the entire length of the Oyster Bay branch to the south over the Norwood division, through West Hempstead and Hempstead Garden, to Valley Stream, to which point the electric line is being extended from Far Rockaway. Many rumors have been going the rounds, one of which is that the control of the Nassau Light & Power Company will, within the next few days, pass into the hands of a new corporation allied with the interests which, it is said, are to build an electric railroad along the north side of Long Island, from Blackwell's Island Bridge to Northport, in the town of Huntington. From Long Island City to Port Jefferson is 58 miles. Running the trolley lines sinuously along the northern shore, so as to take in every little hamlet, as well as the larger villages, will add many miles to the length of the trolley. There are at certain points, such as Sea Cliff, Huntington and Northport, local trolley lines operated by the Long Island Railroad and used by the road as feeders for the steam railroad. These will work in with the proposed new lines, and in no way interfere with the main railroad.

ENGINEERING CLUB IN SAN FRANCISCO.—An engineering club will be formed in San Francisco. The electrical trades will be well represented. Electrical, gas, hydraulic, mechanical and civil engineers are included in the list of prospective members. The committee of electrical men to secure names included L. E. Sperry, George P. Low, T. E. Bibbins, Charges Wiggins and E. B. Parsons.

WIRELESS ON SABLE ISLAND.—The new Marconi wireless telegraph station on Sable Island was opened for business on Sept. 7. The first message received by the station was from Capt. Cueppers of the eastbound North German Lloyd liner Kaiser Wilhelm der Grosse, who said: "Congratulations. First message through Sable Island; 600 miles from New York." The island is 90 miles southeast of Cape Canso, Nova Scotia.

SOCIAL BETTERMENT WORK.—For its attention to the comfort of its women employees, the New York Telephone Company has received an award at the International Exposition at Liege, Belgium, according to a cablegram received at the office of the company. The exhibit of the New York Telephone Company included illustrations of its social betterment work, relative to the care of the telephone girls, in offices where they are provided with comfortable sitting rooms, when off duty, with plenty of current literature to read, dining rooms in care of matrons, where tea, coffee and milk are served free of cost.

LIGHTNING STROKES.—A correspondent of *Fire and Water Engineering* asks: "How is it that more barn fires are due to lightning than to any other cause? I ask this question, because I see that the president of the Home Insurance Company, supported by the testimony of the Iowa Farm Mutuals, claims that such is the fact. He makes the statement that, after having investigated 622 barn fires, he finds that 343 were the result of lightning—over 50 per cent—and 131 were set by incendiaries. If this is so, the further question arises: Why should farmers' barns and not farmhouses be such targets for lightning. It would seem that lightning conductors are not able to avert the lightning stroke."

A FUNNY TROLLEY PICNIC.—The Dobbs Ferry Improvement Society held its first annual picnic and lawn fete on September 17. The proceeds were to enrich its campaign fund next spring for a trolley ticket which will favor a trolley on Broadway. Opposed to it are Edwin Gould, Miss Helen Gould, John D. Archbold, Oswald Villard, O. G. Smith, the Ardsley Club, and other wealthy residents of Broadway. The sentiment for a trolley on Broadway is strong. It took a combination Democratic and Republican ticket to beat it last spring, and then it lost by only five votes. The trolley advocates hope to win out next spring. They will endeavor to have the Burns law repealed which prohibits forever the building of a trolley line on Broadway. The wealthy residents would favor a trolley by any other route. One of the banners at the picnic read: "Broadway for autos and carriages, but it is too nice for trolleys." The situation is developing many humorous features.

Electrical Engineers of the Times.—XXVII.

JOHN STONE STONE.

Mr. John Stone Stone was born in Dover, Virginia, in 1869. He is the son of the late General Charles P. Stone, a graduate of West Point and veteran of the Mexican and Civil wars.

In 1870, General Stone was called to Egypt to reorganize the Egyptian army, where he remained thirteen years, or until 1883, as General Aide-de-Camp to the Khedive and Chief of the Staff of the army. His son, who accompanied him abroad and remained with him during those years, spent his boyhood in Europe and Egypt. On his return to this country in 1883, he prepared for college at the Columbia Grammar School, New York City, and entered the School of Mines of Columbia University in 1886. At Columbia University he studied civil engineering for two years, but having a strong predilection for the study of electricity and physics he left that institution in 1888 and in the same year entered the course in electrical engineering at Johns Hopkins University, where he pursued studies in mathematics, physics and electricity under Dr. Louis Duncan, who was at that time director of the course in electrical engineering at that university. During the summer vacation of the year 1889 Mr. Stone took charge of the American Bell Telephone Company's exhibit at the Paris Exposition. He completed his studies at Johns Hopkins University in 1890, and joined the staff of experimentalists of the American Bell Telephone Company until the year 1899. From 1899 until 1902 Mr. Stone was general consulting engineer, with offices in Boston, and in the latter year became chief engineer of the Stone Telegraph and Telephone Company, a corporation organized for the development of the system of selective wireless telegraphy invented by him.

While with the American Bell Telephone Company, Mr. Stone made a number of important inventions. He was the first American telephone engineer to point out the fallacy of the so-called *K R* law as applied to telephony, and to insist upon the important role played by distributed inductance in telephone circuits. His work on this subject culminated in an invention patented in the United States March 2, 1897. In this patent the losses due to the reflection of energy which takes place at the junction of a cable with an air line in telephone transmission was first pointed out and the first practicable means of increasing the natural inductance of the lines and of preventing the reflection of energy at such junction was shown.

JOHN STONE STONE.

Mr. Stone also invented and patented the centralized energy or common battery system now known as the Stone common battery system, which has been widely used in this country and abroad. He also was one of the first to realize the practical application of resonant circuits to selective signaling and multiple telegraphy, and demonstrated over the lines of the American Telephone & Telegraph Company the possibility of sending two or more messages simultaneously by this means. After leaving the employ of the American Bell Telephone Company, Mr. Stone applied the same principles which he had successfully used in multiple telegraphy over wires to the production of a system of selective or multiple wireless telegraphy. His work for the past five years has been almost entirely in this direction, and the Stone wireless telegraph system is now in use commercially.

For a number of years Mr. Stone was special lecturer at the Massachusetts Institute of Technology upon the subject of electrical oscillations and resonance. Since 1890 he has taken out in the United States nearly 100 patents, largely upon inventions relating to applications of electrical resonance. These inventions have also been extensively patented in foreign countries.

For his work in the application of electrical resonance Mr. Stone was elected a Fellow of the American Academy of Arts and Sciences. He is also a member of the American Association for the Advancement of Science. His most important publications relate to wireless telegraphy and include a paper on "The Theory of Wireless Telegraphy," read before the International Electrical Congress at St. Louis, in 1904, and a paper on "Interference in Wireless Telegraphy," read before the Electrical Section of the Canadian Society of Civil Engineers at Montreal, in 1905.

Along the Niagara-Toronto Transmission Line.

SIX hand drawn copper cables, each of 190,000 circular mils cross section, now stretch over a line of steel towers 75 miles long between a terminal station at Niagara Falls and another at Toronto. In a few weeks the two circuits formed by these cables will be delivering energy generated by Niagara water to the electric lighting, power and street car systems of the second city of Canada.

A general description has been given in these columns of the design and construction of this transmission line, which, by reason of its length, the voltage employed, the amount of power to be delivered, and its steel towers, is one of the most notable in the world. Now it is possible to add some details as to the completed line work. Each of the two groups of three conductors on the steel towers forms a three-phase circuit, which is designed to receive current at 60,000 volts from Niagara Falls, and to deliver 12,000 horse-power in Toronto with a loss of 10 per cent in voltage. A loss of 20 per cent in voltage on the line will be incurred at times, and under these conditions the two circuits will deliver about 43,000 horse-power, with a 100 per cent. power factor.

In its 75-mile course the transmission line of steel and copper takes an outline like the string of a well drawn bow, with the ends at Niagara Falls and Toronto, and the center near the western end of Lake Ontario, which is known as Burlington Bay. Along almost its entire length the line traverses the watershed of the lake approximately parallel with its shore, and thus crosses the numerous creeks that flow into it between the Welland Canal and Toronto. The streams of which these creeks are now only feeble remnants, have in past ages cut wide and deep gorges in the high lands that run back from the lake, and in several instances extra long spans have been necessary at such crossings. About seven miles from Niagara Falls the line crosses the Welland Canal on towers that carry the conductors 150 feet above the water, and on these high towers lightning rods are used. Ten miles from the Niagara terminal station the line begins to verge toward the shore of the lake, and reaches the brow of the escarpment after a run of 29.6 miles, at a point a little beyond Grimsby. From this point to the 35th mile the line carries a galvanized steel cable above the copper conductors as a lightning guard wire. This cable is secured at the top of a central extension of the steel tower which holds it seven feet above the nearest copper conductors. Though resting on the steel work of the towers, the guard cable is more effectively grounded at intervals.

By following the narrow neck of land known as Burlington Beach, which separates Burlington Bay from the main body of the lake, the line avoids a course around its extreme west end, and thus saves several miles in length. For purposes of navigation to the city of Hamilton, near the head of the lake, a canal cuts Burlington Beach, and the circuits cross this canal high above the water. On the north shore of Lake Ontario, near Bronte, the line crosses the gorge of Twelve Mile Creek with a span 630 ft. long. The steel towers at the ends of this span are of extra heavy construction, and each tower carries three insulators in line for the support of each copper cable.

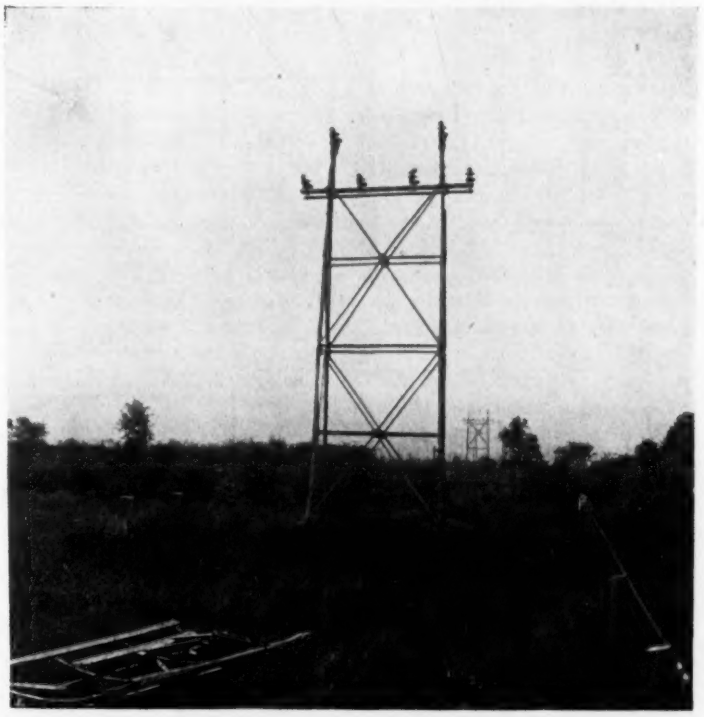


FIG. 2.—LONG SPAN NEAR BRONTE.

About two miles west of Bronte comes the crossing of the transmission line over the Great Western Railway, and at either end of the crossing over Twelve Mile Creek a pair of angle towers is used to increase the distance between the conductors and the railway. From the fiftieth to the sixtieth mile of its length from the Niagara Falls end, the transmission line runs over a right of way that adjoins that of the railway, and in this section are the crossings of both Twelve Mile and Sixteen Mile Creek. At 63.8 miles from the Niagara terminal is the crossing of River Credit

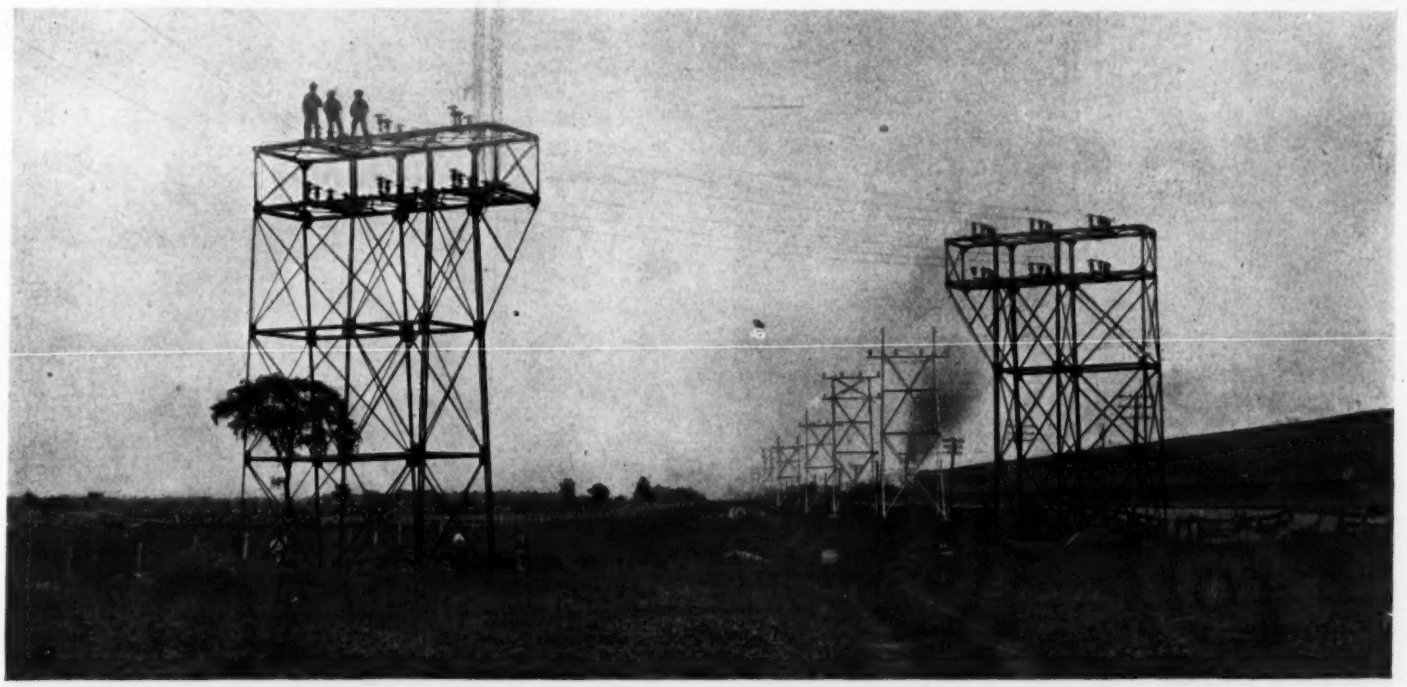


FIG. 1.—ANGLE TOWER NEAR BRONTE.

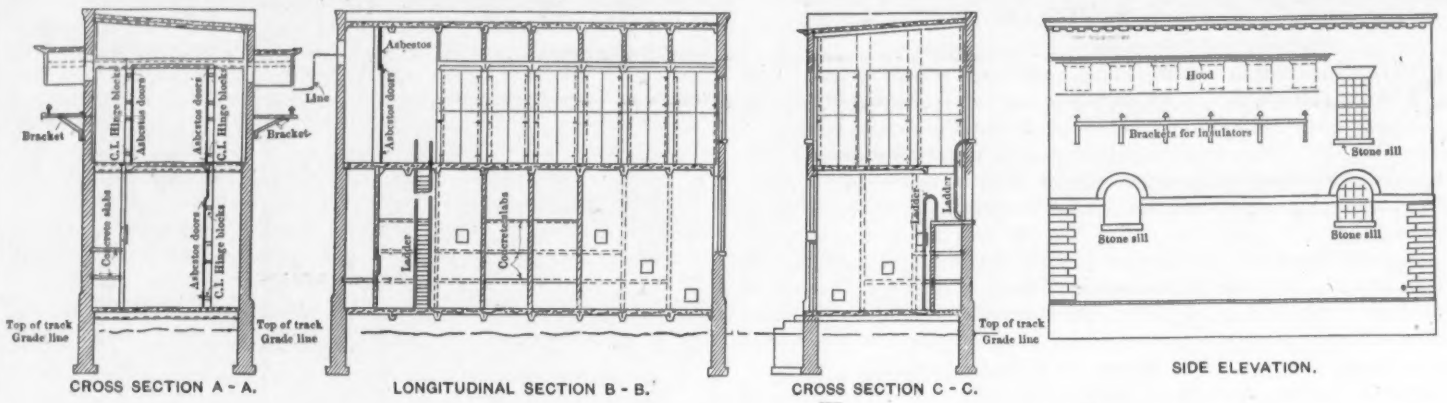


FIG. 3.—SECTIONS AND PLANS, TORONTO TERMINAL STATION.

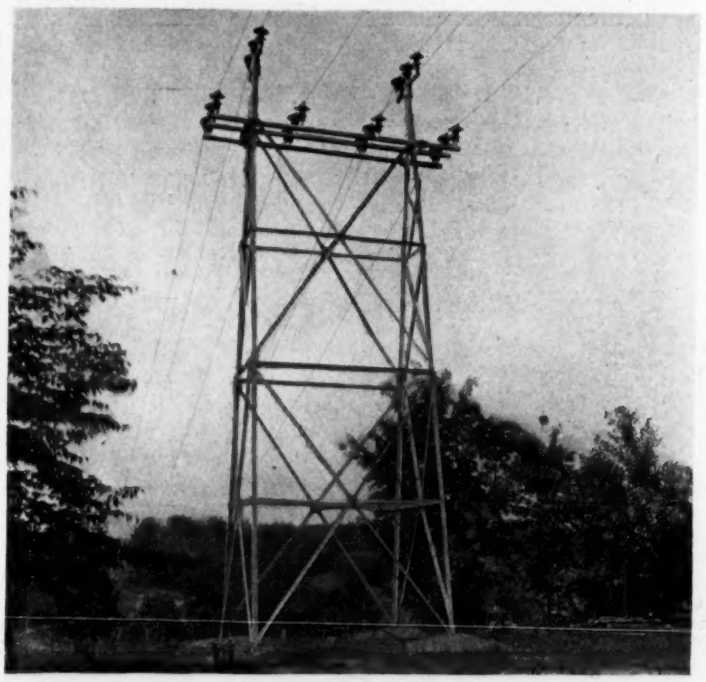


FIG. 4.—HEAVY TOWER AT CREDIT RIVER.

FIG. 5.—TORONTO TERMINAL STATION AND ANCHOR TOWERS.

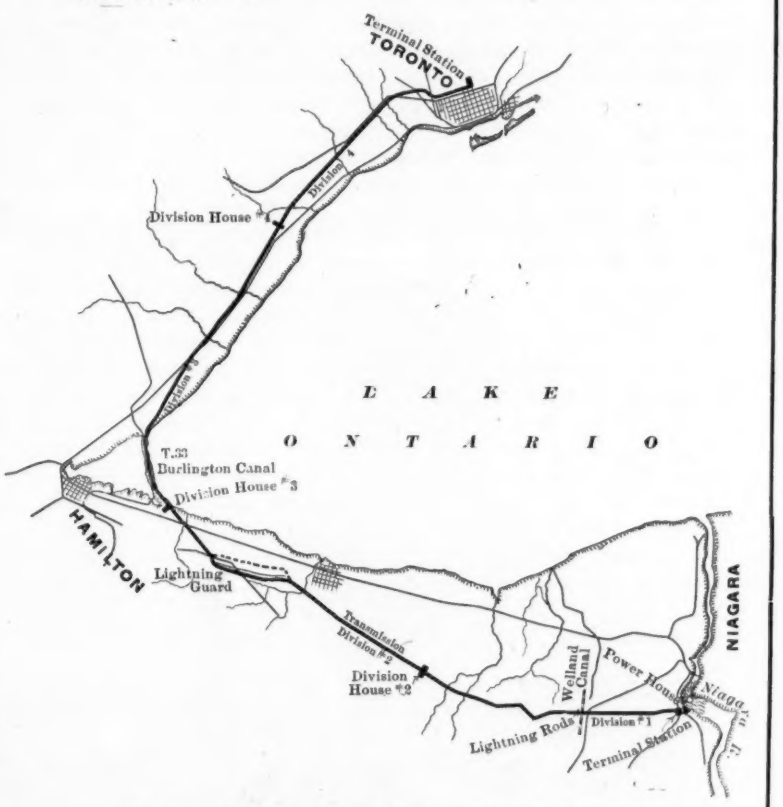


FIG. 6.—MAP OF ROUTE OF TRANSMISSION LINE.

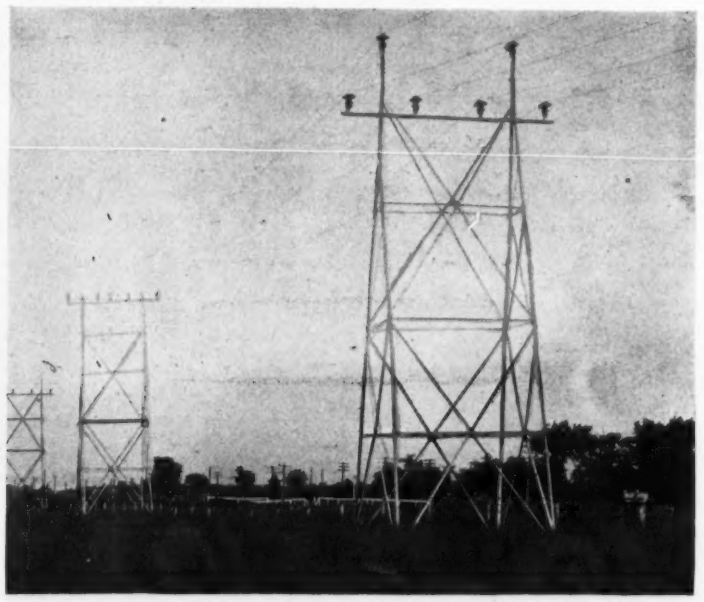


FIG. 7.—TRANSPOSITION TOWER (SECOND TOWER).

ALONG THE NIAGARA-TORONTO TRANSMISSION LINE.

where the span between towers is 766 ft. The tower at each end of this span, like those at Twelve Mile Creek, is of extra heavy construction, carries three crossarms in the same plane, and has three insulators in line for each copper cable.

As it nears Toronto the transmission line swings away from the lake shore, and reaches its terminal station on the northern bound-

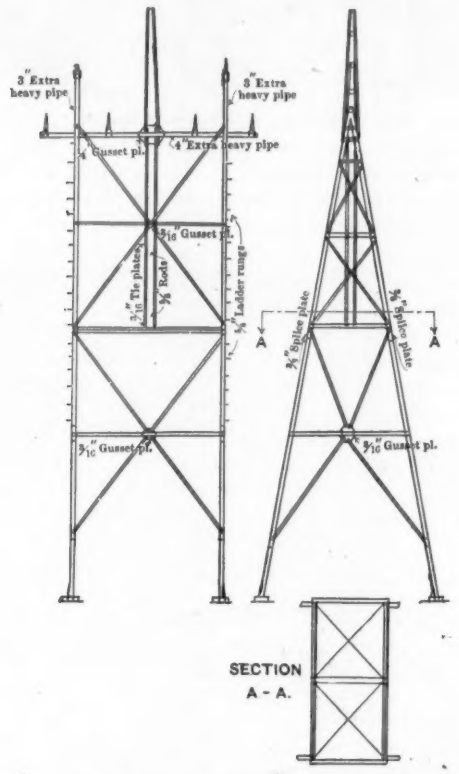


FIG. 8.—ELEVATIONS AND PLAN OF TOWER.

ary of the city, which is the side farthest from the the harbor. Close to this terminal station are the two anchor towers, one for each three-phase circuit, which take the strain of the line before it reaches the entrance hood.

The way in which transpositions of the conductors are carried out along the line is illustrated in Fig. 7, where it may be seen that the transposition tower, the second one in view, has two cross arms instead of one like the standard towers, and carries two wires of each circuit above the third. From the fiftieth to the sixtieth mile, approximately, of the transmission line, where it runs close to and parallel with the railway, the transpositions of the conductors is more frequent than elsewhere, and there are four complete spirals in that section. Three division houses are so located along the line as to cut it into four nearly equal sections. One of these division houses is about 19 miles, another about 40 miles, and the third about 61 miles from the Niagara end of the line.

Through each division house pass the two three-phase circuits, and the switches there make it possible to connect any conductor in the section of the line on one side of the house with any conductor on the other side. Each conductor in a division house is connected with a lightning arrester made for 60,000 volts by the General Electric Company. This lightning arrester contains 240 air-gaps between brass cylinders, and 60 carborundum rods, all in series from the line cable to the earth. A complete lightning arrester as just described is mounted on porcelain line insulators, is 25½ in. wide and 19 ft. long.

Each tower has a good ground connection and it will probably act to some extent to protect the line against an actual stroke of lightning. It is evident, however, that the towers cannot be depended upon as a protection against static and inductive influences, and the lightning arresters are just as necessary on steel as on wooden poles. It is believed that the guard cable, mentioned previously, and the arresters will furnish adequate protection for the line.

To Dr. F. S. Pearson, Consulting Engineer of the Toronto and Niagara Power Company, which is carrying out this transmission to Toronto, and to Mr. Robert C. Brown, Chief Electrical Engineer of that company, are due acknowledgments for the above facts.

Motor Rating Diagram.

By C. P. Nachod.

A concise and convenient method of expressing the characteristics of a complete line of motors of one type, but of various speeds and outputs is here outlined. In the cut below, the areas, *A*, *B*, *C*, etc. correspond to the sizes of frames comprising the line of motors. The radial lines denote speed in revolutions per minute and their ordinates, horse-power. To use the curves, suppose the designer or estimator has an inquiry for a 30-hp motor at 1,100 r.p.m. The intersection of the horizontal line passing through 30-hp and the line denoting 1,100 r.p.m. falls in the area marked *D*, whence this is the frame needed.

Suppose it is required to find the speed of a motor on an *F* frame to give 40-hp. Following the 40-hp horizontal until it intersects the line bounding the areas *F* and *G*, the intersection is seen to be traversed by the radial line denoting 600 r.p.m., which is, therefore, the lowest speed at which that output could be obtained. Or let it be required to find the horse-power that can be gotten from an *E* frame with a motor speed of 600. The intersection of the boundary line between *E* and *F* with the speed curve for 600 r.p.m. is seen to have an ordinate of 28-hp, which is the maximum output. In this "shotgun" diagram, then, every motor is represented by a point, whose ordinate is the horse-power, whose position in certain areas is the frame, and whose position on the radial lines is the speed.

The boundary lines between the areas are not hard and fast, since one combination of slots and conductors is more effective than another; and also since there are only a limited number of combinations available. When a motor rating falls on or very near a boundary line, that rating cannot be positively assumed but must be checked by a further calculation of the motor.

In constructing such a set of curves for a particular line of motors it is only necessary to know the maximum torque, or, what is proportional to it, the maximum horsepower per 100 revolutions for each size of frame. The output of a motor giving 10-hp per 100 r.p.m. at 500 r.p.m. is 50-hp. Therefore, the speed-curve for 500 r.p.m. passes through the point whose co-ordinates are 10-hp per 100 revolutions and 50-hp. It also passes through zero, and is a straight line; and is thus completely determined. By noting that at the abscissa 10 the speed curves intersecting the vertical are those of 10 times the corresponding ordinate, the curves can be drawn without calculation.

The lines marking the frame areas, denoting the maximum horsepower per 100 revolutions are drawn not quite vertically, but with a slight inclination to the right. This is to allow a higher torque for the higher speeds, due to the improved ventilation, the same heating

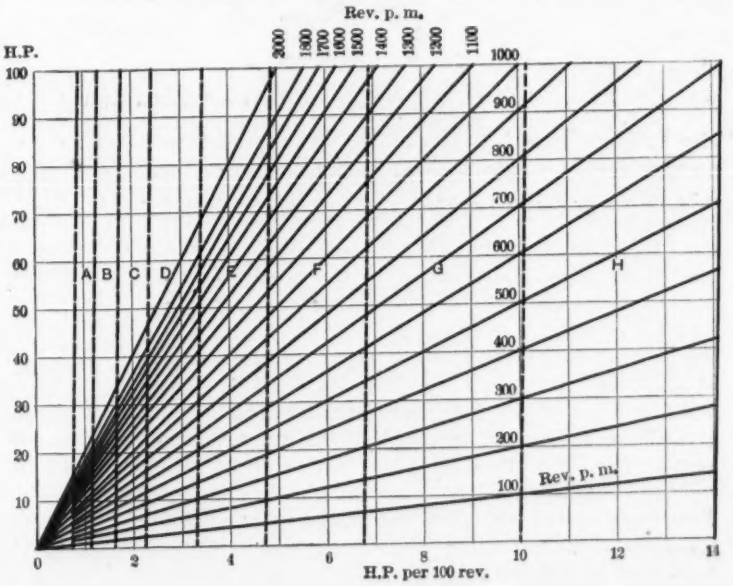


DIAGRAM OF MOTOR RATINGS.

limit being presupposed for all cases. In all strictness, these may not be straight lines; and the amount of slewing may be difficult to determine.

In the line of motors, from which these curves were made and used, the motors are so graded that the maximum torques for each frame are approximately in a geometrical series.

The Bellinzona, Italy, Hydro-Electric Station.

By S. Herzog.

THE city of Bellinzona originally possessed a small station near Corduno, producing single-phase, alternating current at a tension of 2,000 volts for lighting purposes. This, however, soon ceased to satisfy the steadily increasing demand for electrical energy in the progressive industrial development of the capital of the canton. The tender of the Alioth Electrical Co. in Muenchenstein, Bâle, which had been entrusted with the building of the station in the first instance, was accepted for the enlargement of the electrical part of the station. The power is obtained from the Marobbia, a small mountain stream flowing into the River Tessin at Giubiasco, a station on the Gotthard Railway. The work was completed in the year 1901.

The Marobbia, which possesses a very large fall, has its source in the mountains on the left bank of the Tessin. In spite of the fact that the drainage area of the Marobbia is very small, the minimum flow of water is considerable, and judging from the best results of many years, may be taken at the very least at 600 liters per second.

Thanks to extremely well planned arrangement for collecting the water, a gross fall of 350 meters was obtained by means of a comparatively short inlet pipe and a barrel about 900 meters in length.

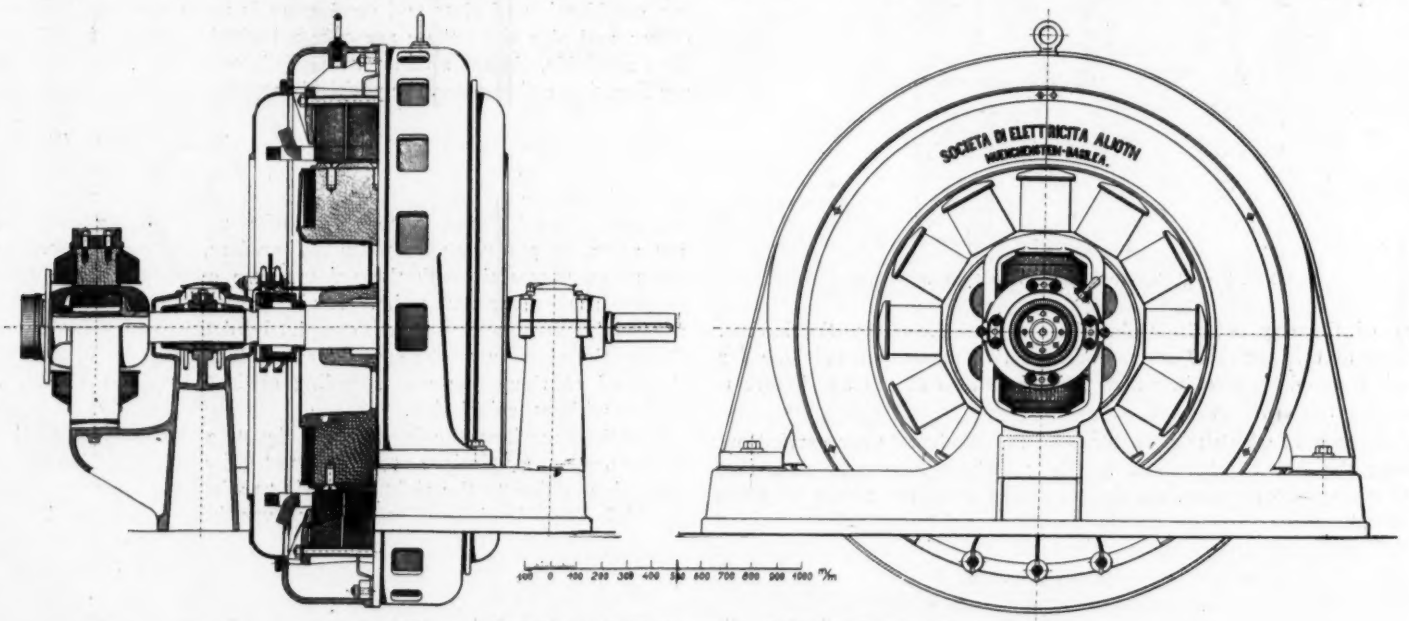


Fig. 1.—Section and Elevation of 660-hp Generator.

The concrete weir is covered with hewn stones, and has an inclined plane of chestnut wood before the stone inlet. The rake is of rectangular irons with the corsers turned against the direction of flow.

At the inlet there comes a gallery of 1.5x1.85 meters, for the greater part roughly blasted out of the rock. Concrete is used only where it goes through crumbling stone or glacial moraines. The length is about 4 km. and the fall about 2 per cent. Two bridges were necessary for the conduit, one of concrete, the other of brick, with a single arch.

Between the amply dimensioned reservoir at St. Antonio and the end of the gallery, arrangement is made for a large overflow, as seen in Fig. 2, so that the water-level may be maintained almost constant, notwithstanding the variation in the consumption of power. Two easily moved racks, one coarse, the other fine, cut the reservoir off from the short piece of inlet canal. In the interior of the reservoir, just at the inlet, there is arranged an automatic cut-out valve which stops the flow of water into the distributing circuit as soon as the speed of the water in the latter exceeds a certain limit that might lead to a bursting of the pipe.

The whole 1,900 meters of the pipe line is divided into two zones. From the reservoir to the pressure 228, a length of 600 meters, the inside diameter of the pipe is 700 millimeters, and from there to the power station the diameter has been chosen as only 600 millimeters.

The pipes are made of best Siemens-Martin sheet iron with rather low ultimate strength, but an extremely high ductility. The factor of safety against fracture is, therefore, very great, for such ductile material would resist shocks, movements, even falling stones and land slips, or any other similar test, without any damage. Six kilograms per square millimeter was chosen as the maximal strain. The thickness of the iron for the pipes of the first zone is, therefore, 6 to 14 millimeters, and the second, 14 to 19 millimeters Each pipe has a length of 10 meters and is transversely and longitudinally welded, so that there is no rivet along the whole length of the line, and the water flows over a perfectly smooth surface. Particular care was taken with the connections of the flanges, these being the parts of the system most sensitive to such a high pressure. The flanges were formed by bending over the edges of the pipes to overlap, and made broad enough for screws to be put through, increasing the strength of the connection considerably. Two strong wrought-iron rings are used to strengthen the seats of the screws one on each side of the flange. The flanges are made tight by rubber rings. This type of flange allows a large longitudinal displacement of the pipes while still being extremely strong —a feature of great importance. All the pipes were tested at double the working pressure in the factory of Messrs. Escher Wyss & Co., who delivered the pipes and turbines.

As the whole pipe line is on the surface, large supports and adjustable pipe couplings had to be employed at rapid increases of the fall. In all, six were necessary. At the commencement of the pipes, with a diameter of 600 millimeters, an extremely steep fall of 100 meters is covered with a single coupling. The difficulties to be overcome were very great; it was necessary first to blast the rock to form a bed for the piping and raise the steel tubes each 10 meters long and weighing 4,000 kg. up the face of the cliff. The pipe line continued at the foot of the cliff on a bridge about 30 meters long over the Marobbia. (See Fig. 4.) Powerful piers support the bridge and the piping at the banks of the river, particularly on that bank opposite the face of the cliff where the piping makes a sharp bend immediately after leaving the bridge and enters the power station about 50 meters further on. Just in front of the station there is a large cast-steel slide valve. Safety arrangements are also built in the main at the machine house to prevent the occurrence of an excess pressure in the main. At a certain pressure there is made an opening through which a certain amount of the water is allowed to pass. On account of the pressure regulating apparatus on the turbine, as described below, these arrangements will be seldom, if ever, used; nothing has been neglected that tended to make the working of this important system safe and trustworthy in every respect. In fact, since the system was opened three years ago, there has never been a stoppage.

The power station (Fig. 7) lies close to the little village of Giubiasco at the entrance of the Marobbia Gorge, about 4 km. distance from Bellinzona. The station house is built of brick and stone work with concrete foundations. The roof is of wood covered with

FIG. 2.—VIEW OF RESERVOIR, SHOWING OVERFLOW.

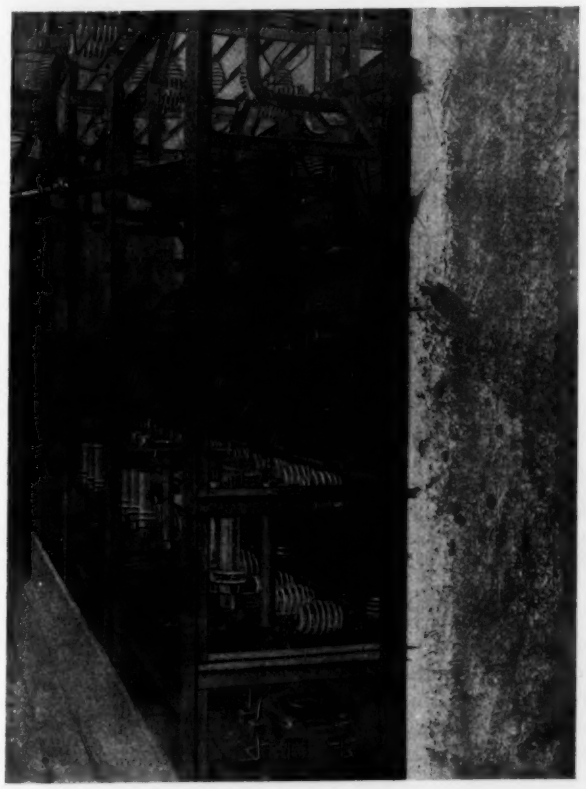


FIG. 3.—APPARATUS ROOM BEHIND SWITCHBOARD.

FIG. 4.—VIEW OF PIPE LINE, SHOWING BRIDGE.

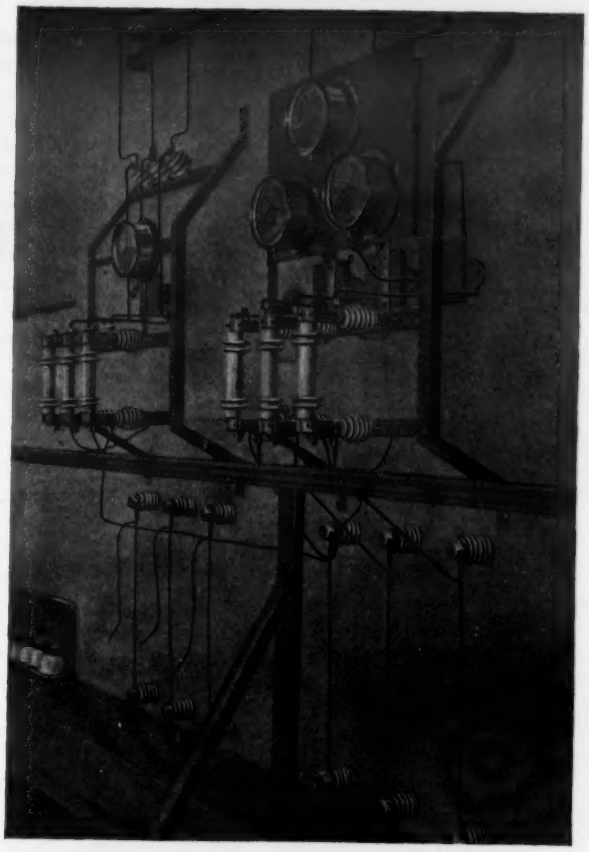


FIG. 5.—APPARATUS ROOM ON FIRST FLOOR.

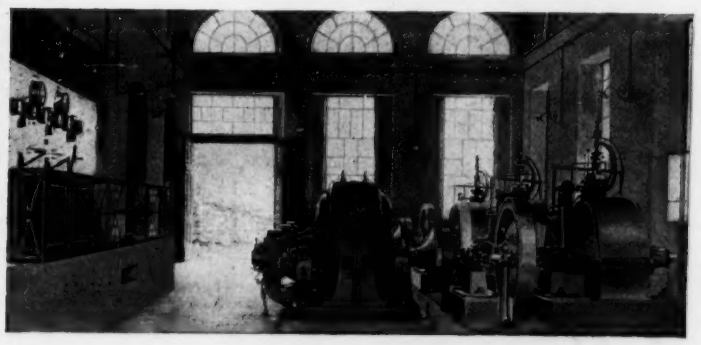


FIG. 6.—INTERIOR OF POWER STATION.

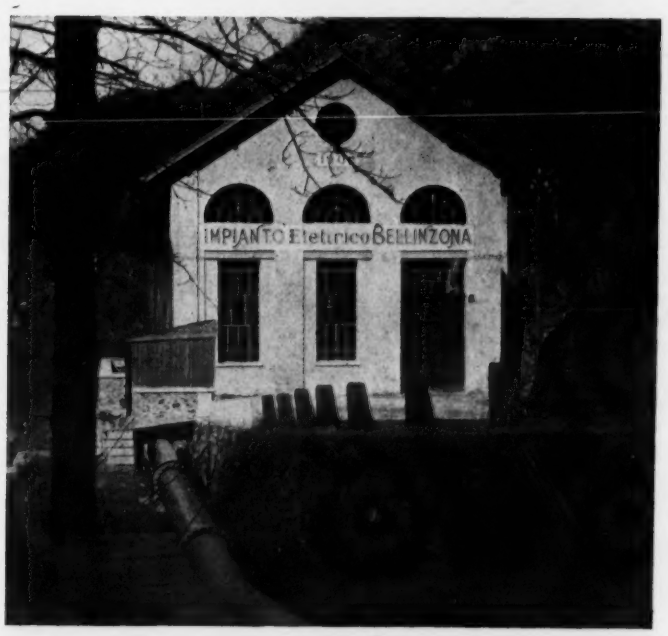


FIG. 7.—EXTERIOR OF POWER STATION.

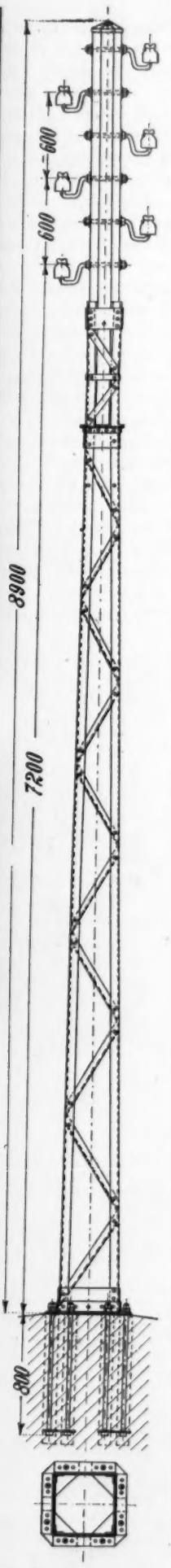


FIG. 8.—IRON POLE FOR HIGH-TENSION CIRCUITS.

THE BELLINZONA, ITALY, HYDRO-ELECTRIC STATION.

tiles. Part of the machine room is enclosed off to hold the instruments. A 10-ton overhead traveling crane is provided for the erection of the machines.

The turbines are reactional tangential wheels of the Pelton type with external flow. The diameter of the wheels is 1,400 millimeters. The wheels are fitted with shell-shaped interchangeable cast steel buckets. The interchangeability of the buckets is very desirable in the case of high pressures, and of water containing a good deal of sand. For, as time goes on, the blades become worn and blunt and so lose a good part of their effectiveness. The section of the inlet arrangement is regulated by a tongue, which in its turn is directly governed by the speed regulator. This speed regulator acts directly on the hydraulic control valve, which produces in the space above the regulating piston a more or less large pressure effect. The piston is rigidly attached to the tongue so that the latter is moved corresponding to every alteration in the pressure on the piston. Consequently each change in the length of the spring pendulum, caused by the alteration in speed, varies the section of the inlet.

Each turbine is fitted with a pressure regulator to minimize the shock that ensues when the turbine is suddenly cut out. This apparatus is opened by a powerful hydraulic piston in the same degree as the turbine is cut out. To avoid all unnecessary losses of water the apparatus is so arranged that after being opened it closes again automatically without causing any pressure increase. The turbine axles are made of Siemens-Martin steel and run in bearings with automatic lubrication. Each group is fitted with a cast-steel fly-wheel. The covers of the turbines may be taken off

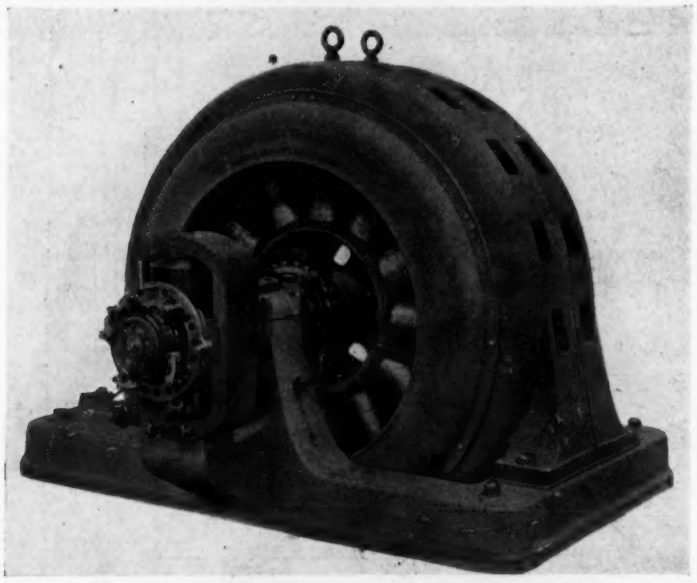


FIG. 9.—VIEW OF 660-HP GENERATOR, SHOWING EXCITER.

for the purpose of assisting the inspection of wheel and inlet arrangement.

There is a filter for each turbine through which the water for the hydraulic regulator passes. The filters may be cut out, cleaned and inspected without disturbing the turbine. The regulators are so arranged that after a sudden cut-out of the total load on the turbine the speed does not exceed the normal by more than 10 per cent, and that during the two or three seconds necessary for the operation the normal pressure does not increase by more than 10 per cent. The turbines are coupled to the generators by means of the elastic and insulating Zodel clutch, as shown in Fig. 6. The generators from the Alioth Electrical Co. are built to take up 660 horsepower. They produce at 500 r.p.m. three-phase current of 5,350 volts and 50 cycles per second. The generators, whose general constructional features may be seen in Figs. 1 and 9, have 12 poles. The exciter is directly coupled to the generator. The stator has two slots per pole and per phase. There are 12 coils of 14 turns per phase. The winding is carried out in the star connection. The conductors are insulated by micanite 2 millimeters in thickness. The field coils are connected in series, and each has 134 turns.

The switching apparatus is arranged in separate rooms shut off from the machines. (See Figs. 3 and 5.) One three-pole switch, one regulating arrangement, one three-pole safety fuse, one ammeter, and one voltmeter for the current produced and one ammeter and one voltmeter for the exciter are provided for each machine. A voltmeter switch is arranged to measure the e.m.f. of the lighting or power current. There are provided two general voltmeters for controlling the e.m.f. of the bus-bars. The universal switch is so controlled that it may be worked only after the generator itself is cut out. The lightning arresters are in the top apparatus room set up on the outside wall towards the Marobbia side of the station. One transmission line goes from the station to Bellizona, another goes to Giubiasco. The wires to Bellinzona are carried on an iron pole line, a standard trellis-work pole of which is illustrated in Fig. 8. Triple-cloaked insulators are employed.

At the present time the circuit feeds Bellinzona (seven transformer stations), Giubiasco (two transformer stations), and Castrone (one transformer station). Special brick buildings are provided for the transformers at Bellinzona; the electric fittings were made by the Alioth Electrical Co. Each transformer has a capacity of 33 kilowatts. One station at Bellinzona contains two, another three, and the others one transformer. In the village of Giubiasco there is a 33-kw transformer, and at the railway station, and in Castrone and Mollinazo are used 10-kw, single-phase transformer. In Mollinazs there is also a 10-kw three-phase transformer. All transformers outside of Bellinzona are fixed on poles.

Regulation of Electric Rates In Massachusetts.—III.

BY ALTON D. ADAMS, LL.B.

BELOW are given synopses of further decisions in regard to electric rates, etc., by the Massachusetts Gas and Electric Commission:

Mayor vs. Waltham Gas Light Company.

In this case the mayor of Waltham sought a reduction in the rates charged for gas and public and private electric lighting by the Waltham Gas Light Company. The net rate for arc and incandescent lighting was $1.25 per 16-cp lamp-hour by meter. One commercial arc lamp per consumer was operated daily to midnight at $12.50 per month, and five nights per week at $10 per month, by contract. For larger numbers of commercial arcs the rates were lower. Arc street lamps of 1,200 cp nominal numbering 147, were operated every night during 6.5 hours, on a yearly average, at 23 cents per lamp per night. For arc lamps consuming 330 watts each this rate amounts to 10.7 cents per kw-hour. Street incandescents of 25 nominal cp to the number of 175 were operated 7.3 hours per night, on an average, and 20 nights per month, at the rate of 8 cents per lamp per night, which corresponds to 12.5 cents per kw-hour, with 87.5 watt lamps. The Commissioners fixed the maximum net rate for commercial arc lamps six nights per week at $9 each per month, and lamps burning four nights per week at $7 each per month. For commercial incandescent lighting the maximum net rate by meter was fixed at 18 cents per kw-hour. These rates were to go into effect on June 1, 1901. No change was made in the rates for street lamps. The Waltham company had operated the only systems of gas and electric supply in that city since 1886, when it purchased the electric system.

On June 30, 1900, the company had capital stock of $175,000, bonds of $50,000 and notes payable of $24,000 outstanding. Stock to the amount of $130,000 had been issued by the company before it engaged in the electric business in 1886, and the additional issue of $45,000 in stock and $50,000 in bonds appeared to represent the electric system. The notes of $24,000 seemed to stand for a loss through depreciation rather than any value in the plant, according to a statement of the Commissioners when they refused to allow an issue of stock sufficient to cover the floating debt of the company, in 1899. During the year ending June 30, 1900, the company derived $49,678.98 from sales of electric energy, and the operating expenses in its electric business were $41,077.66, so that the net electric income was $8,601.32. Interest to the amount of $3,609.80 was paid during the year, leaving $4,991.52, or 11.09 per cent of the $45,000 in capital stock devoted to the electric business. During the following year, that ending with June 30, 1901, the electric earnings were $63,087.05 gross, and $18,585.38 net, but in this year the rates fixed by the Commissioners were in force during only

one month. In the year ending at the middle of 1902, during all of which the maximum rates fixed by the Commissioners applied, the company earned $78,479.13 gross and $25,758.83 net in its electric business.

At the hearings it was claimed that the Waltham company was supplying current to a street railway at less than cost, and that on this account the prices to general consumers were too high. The Commissioners said that the street railway contract seemed to have been absolutely unprofitable to the company and that "The contract ought not to be renewed at the old rates; and if it shall be, the shareholders, and not the consumers, must expect to bear the burden thus imposed." It was also said, however, that the supply of power to a street railway may be of advantage to all concerned, though the rate for such service is less than those necessary for general business. So, too, it may be to the advantage of a company and its customers that electric power be supplied for general purposes at a lower rate per unit than could be applied to the entire output. Net earnings of the electric business appeared to the Commissioners to have been insufficient to meet the capital and depreciation charges belonging to that department, and the policy of the company had been to impose some of the burden of the electric business on the gas income. As to such a practice in relation to the gas and the electric business, the Commissioners said that: "Neither ought to be distinctly burdensome to the other, unless upon stronger grounds than we are able to find in the present case. In this view, customers for each kind of light are entitled to receive it at its independent fair cost, neither enhanced nor diminished on account of conditions in the other department."

While the rate for arc street lamps was about 10 cents per kw-hour, the rate to private consumers was approximately 16 cents. The Commissioners thought it difficult to determine whether so large a difference in rates was justified, but said that "This Board, however, has no authority to require the rate to be increased, even if it be clear that it is unfairly low." Since the entire electric income, even with a fair rate for power, seemed to promise little more than a fair profit, the Commissioners did not see their way clear to reduce the rates for street lighting.

(12.) Mayor vs. Newton & Watertown Gas Light Company:

A reduction in the rates for gas and electric light supplied by the company was sought under this petition by certain consumers in the city in 1900. The petitioners also desired better gas and electric service. After a hearing the Commissioners on June 24, 1901, refused to make any reduction in the rates for either street or commercial electric lighting. Between the time of the hearing and the decision the Newton company began to operate its electric plant throughout the day, as had been requested, and arranged to spend about $37,000 on this plant in a way that would remedy the defects in its service. No order was therefore made on this part of the case.

Since 1888, when it bought out the local electric company, the company had operated the only systems of gas and electric supply in Newton and Watertown. This was chiefly a residence district, and about 75 per cent of the electric output of the company was used for street lighting, but this service yielded the company only about 40 per cent of its electric income. At the time of the hearing the company was operating 222 arc lamps of 1,200 cp nominal, each on the streets during 3,940 hours per year, at $100 each. This rate corresponded to 7.7 cents per kw-hour. There were also operated on Newton streets 957 incandescent lamps of 25 nominal cp until 12:30 every night, or 2,262 hours per year, at $15.50 per lamp annually. These lamps, therefore, cost the city 7.9 cents per kw-hour. In Watertown there were 395 of the 25-cp lamps that operated 1,573 hours per year at $13.50 each annually. For commercial arcs and incandescents the maximum rate was 18 cents per kw-hour, and the rate per unit actually received for street lighting was less than one-half of that yielded by the commercial service. On June 30, 1900, the Newton company had a capital stock of $250,000, bonds of $90,000, and notes payable to the amount of $6,000 outstanding. In 1888, before it bought out the local electric company, the Newton company had a capital of $200,000, and no bonds or notes outstanding. While the fact is not clear it may be assumed that the increase of $50,000 in stock and of $96,000 in bonds and notes was represented in the electric plant. During the year ending on June 30, 1900, the Newton company derived a gross income of $70,134.54 from its electric business, its operating expenses were $58,839.96 in that department, and the net electric income was $11,294.58. Interest of $4,682.32 was paid, and this left 13.2 per cent on the $50,000 of stock that was probably represented in the electric plant. The Commissioners said that the gross profits of about $11,000 in the electric business was probably no more than was needed to meet a fair investment charge and depreciation. While pointing out that they had no authority to increase the rates for street lighting, the Commissioners said that the return realized by the company on its investment for this service was lower than that at which interest was paid on its loans, and that they could not approve of rates for municipal service so low that the entire burden of the investment charge was imposed upon private consumers.

(13.) Consumers vs. Woburn Light, Heat and Power Company:

In 1900 a petition was brought against the Woburn Light, Heat & Power Company by some of its customers in Winchester, asking a reduction in the rates for electric lighting. The principal cause of complaint was a new system of rates that had been adopted by the company, but during the hearing the company abandoned the new rates and the commissioners did not think proper to make any further changes. For the year ending June 30, 1900, the regular net rate of the Woburn company for incandescent lighting by meter was 20 cents per kw-hour, and a little less than 40 per cent of the income of the company came from its commercial service, at meter and contract rates. On July 1, 1900, the company adopted a new meter rate with a fixed charge in each month equal to 6.25 per cent of the amount paid by each consumer during the previous year. Besides this fixed charge, the meter rate for energy actually consumed was 5 cents per kw-hour. At the hearing the company agreed to abandon this method of charging and to adopt one under which the price to no consumer should exceed 20 cents per kw-hour. Subsequently the company put into force a system under which each consumer paid a fixed monthly sum according to his maximum demand for energy, and also a rate of 6 cents for energy actually consumed. This basis of rates went into force on July 1, 1901, for all consumers, and the Commissioners said that after its operation had been shown the way would be clear for any advisable reduction, or to remove any inequitable features of the plan. During the year ending June 30, 1900, the company had an electric income of $57,439.30 gross, and $25,138.75 net. This latter amount was reduced to $13,670.14 by interest payments on bonds of $175,000 and notes of $24,624.74, and this net earning, less interest, was 8.3 per cent on the $163,000 of capital stock. For the year ending June 30, 1902, the first during which the maximum demand rates were in force for all consumers, the Woburn company earned $84,544.73 gross, and $37,731.38 net. Interest payments reduced this latter sum to $25,600.26, which was 14.6 per cent on the $175,000 of capital stock then outstanding.

(14.) Mayor vs. Worcester Electric Light Company:

In this case the mayor of Worcester sought a reduction in the rates charged for street lighting in 1901. On June 30 of that year the company was operating 696 street arcs of 2,000 nominal cp every night during 10.5 hours, on a yearly average, at the rate of 32 cents per lamp per night. At this rate the charge for energy used in lamps taking 480 watts each was 6.3 cents per kw-hour. There were also 7 street incandescents of 32 cp operated during the same time as the arcs at $24 each. Complying with the petition of the mayor the Commissioners on October 4, 1901, fixed the rate for the arcs at 30 cents each per night, which corresponds to 5.95 cents per kw-hour to go into effect at noon on October 15.

On June 30, 1901, the capital stock of the Worcester company was $400,000, and it had out neither bonds nor notes. During the year the company had an income of $230,796.59 from sales of electric energy. Its operating expenses were $128,236.20, and the net income was thus $102,560, or 25.51 per cent on the capital stock. For that year the company paid a dividend of 7.5 per cent. Meter rates to private consumers in Worcester were 15 cents per kw-hour, with varying discounts up to 30 per cent, depending on the amount of each monthly bill. Besides charging off $54,281.53 for depreciation, the company had a nominal surplus of $294,689.53 at the close of the year under consideration.

The Commissioners said that perhaps the most important question in the case was, how far the public might properly share in the benefits of the surplus, and that: "What the corporation has already earned and saved it has a right to retain. It is its own property, and there is no law nor any principle receiving general public opinion by which its surplus can be directly diminished for the purpose of selling at less than a fair profit. But it must not

be forgotten that, however wise and skillful may have been the management, the company has been able to acquire its present accumulations only by the exercise of a monopoly which has been enjoyed by the favor of the State, and which is, in a measure, assured to it by law. This is certainly a most important contribution by the public to the company's prosperity, for which the public is entitled to special consideration. When both parties have so clearly contributed to these results neither ought to claim the exclusive right to the benefits they confer. These conditions impose upon the company a duty to share these advantages with the public, if not as a matter of legal right, yet as a sound public policy. Such division of them will be to the company the surest guarantee of the continuance of its monopoly, just as the public interest will be most surely promoted by a ready recognition that a portion of them belongs to the corporation. The reasonable price to be charged is therefore not to be determined by prices which may be paid elsewhere to other less fortunate companies, but is to be one which this company with all its facilities and advantages may reasonably be required to make. We cannot, however, require such a division of profits to be carried so far that any portion of the company's product should be sold at mere cost, without profit, even to the municipality."

As to the duty of the company in the matter of rates the Commissioners said that it should render the public service for which it was created at the lowest reasonable cost, and added: "This proposition, however, does not necessarily conflict with the claim that the municipality may be entitled to some differential advantage, as compared with private consumers generally. The city is the largest customer of the company, and, like other large customers, has the right to supply its own electric lights, if it shall think advisable so to do; and, just as a large private consumer may be entitled to a price as low as he himself could make the lights, so the municipality may be entitled to a price as low as it could render equal service with its own plant."

(15) Selectmen vs. Bridgewater Electric Company:

This was a petition by the town of Bridgewater for lower rates on street lighting in 1901, and a petition by the company for higher rates was heard at the same time. Arc lamps to the number of 34 of 1,200 nominal cp were operated on the streets at $70 per lamp annually. Owing to discounts for low voltage, amperage and outages the rate actually paid was about $65 per year. Apart from the question of price the quality of the lighting service was not satisfactory. During the year ending June 30, 1902, these arc lamps operated 1,291 hours, so that the energy rate on the basis of 330 watt lamps, at $70 per annum, was 16.3 cents per kw-hour. After the hearing the town and the company renewed their negotiations at the request of the Commissioners, and the company proposed to continue the street lighting at the rate per lamp and about the number of hours per year above named. The company also agreed to invest an additional sum that the Commissioners thought would provide ample equipment for the street lighting service. On these facts the Commissioners, on November 14, 1902, said that the conditions as to the service were as rigorous, and the price proposed by the company as low as they could impose, and no order was made. It was also stated in the opinion on the case that the electric service was poor, the price paid by the town too low, and that these conditions could only be changed by the expenditure of a considerable sum on the plant. On June 30, 1902, the company had issued $15,000 in stock and a like amount in bonds, but it was said in the opinion that the structural value of the electric plant was less than the par value of these securities. During the year ending on the date just named the electric income of the company was $6,656.67 gross and $1,487.90 net, and it paid $750 in interest.

(16) Consumers vs. Natick Gas & Electric Company:

These were petitions by consumers in Wellesley and Wayland, complaining of the quality of the electric lighting service supplied by the Natick Gas & Electric Company in 1902. After the hearings and an investigation by the Commissioners they stated in the opinion on the case "that the service of the company was unreliable, the lights were often feeble, and the supply at times practically suspended." The company, after the hearings, contracted for apparatus that was capable of giving proper service, and relying on the promises of the company to remedy the defects complained of, the Commissioners made no order in the case.

(17) Mayor vs. Chelsea Gas Light Company:

A petition was filed by the mayor of Chelsea, in 1904, for a reduction in the gas and electric rates of the Chelsea Gas Light Company. The company was then charging 20 cents per kw-hour, subject to discounts from 10 to 50 per cent for consumers using between 500 and 1,000 kw-hours per month for commercial lighting. About one-half of the commercial lighting was done at the 20-cent rate. For electric power the rate was 10 cents per kw-hour, with discounts that varied with the amount of energy used. On October 28, 1904, the Commissioners fixed the maximum net rate for commercial lighting at 16 cents per kw-hour by meter, on and after November 1. No order was issued as to the rates for electric power or for street lighting. On June 30, 1904 the Chelsea company was operating 201 incandescents of 25 cp at 9 cents per night, and 232 arcs of 2,000 nominal cp at 33.5 cents per night on the streets every night, with an annual average of 10.9 hours per night. For the incandescent lamps taking 87.5 watts each the rate just named amounts to 9.4 cents, and for the arcs taking 480 watts each, to 6.4 cents per kw-hour. After the hearing the mayor and the company began negotiations as to the rates for street lighting, and the Commissioners understood that no order was desired on that part of the case. On June 30, 1904 the Chelsea company had capital stock to the amount of $300,000, bonds of $175,000, and notes payable of $15,000 outstanding. The entire capital stock of the company had been issued before it engaged in the electric business, but it is not clear whether the $190,000 of bonds and notes had all been invested in the electric plant, or whether a part of this sum had gone into the gas plant. During the year ending on the date last named the gross electric income of the Chelsea company was $86,776.50, its operating expenses in the electric business were $53,733.54, and the net earnings were thus $33,042.96. The entire payment of the company for interest in the year under consideration was $7,870.97, so that the excess of net electric earnings over interest was $25,171.99. As noted above, the maximum possible par value of securities representing the electric plant was $190,000, in bonds and notes, and of this sum the $33,042.96 in net electric earnings was 17.3 per cent. In this same year the average price of all the energy sold for street and commercial lighting was almost 13 cents per kw-hour, or 3 cents below the price fixed.

The Power Plant of the Post Office Square Building, Boston.

Small, isolated plants are in all essential details very much alike to-day, and these details are well known. Yet it seems worth while, once and again, to describe some such plant in order to give an idea what the current practice is, and how far such a plant embodies it. In many respects, moreover, an isolated plant of minor magnitude differs from a small central station.

One of the latest plants to be placed in service in Boston is the installation at the Post Office Square Building, located in the basement of a new brick and steel structure of eleven stories at 97 Milk Street, between Federal and Congress Streets. The plant is designed to supply the heat for the entire building, power for the elevator service, and current for the corridor lights on each floor. Emergency connections are provided, so that the entire electrical supply of the building may be drawn from the three-wire mains of the Edison system, although ordinarily the central station people take care of only the office lighting. The plant thus furnishes the rather unusual example of an isolated installation which divides its regular load with the outside supply company, the reason for this practice lying chiefly in the desirability of separating the office lighting from the electric elevator load.

Coal is dumped into a bin on the Congress Street side through sidewalk scuttles, the storage capacity being about 35 tons. From the bin the coal is brought to the boiler room in a wheelbarrow holding about 175 pounds, whence it is dumped upon the boiler room floor and fired by hand into the furnaces. About 2,800 pounds of soft coal are now being burned per day in the plant. The boilers are two of the horizontal return tubular type with shells 66 in. in diameter, triple-riveted, butt-strapped and rated at 100 hp each. The operating steam pressure is 80 pounds and the boiler room is about 20 ft. by 40 ft. in width and length. The boilers were made by the Cunningham Iron Works, of South Boston, and installed by Ingalls & Kendricken, of Boston, engineers for the heating and ventilating of the building. A striking feature of the entire plant is the liberal space allowance—a pleasing contrast to many office building instal-

lations of the present day. The feed pumps consist of two duplex Blake piston pumps, cylinders 6 in. by 4 in. by 6 in., mounted in the engine room. The two pumps are supplied with high-pressure steam through a 1½-in. main in which is located a Curtis automatic valve operated by a float in the receiving tank, which takes all the drip and condensation from the heating system of the building. The receiving tank is also set up in the engine room, and it is about 6 in. in diameter by 36 in. long. The Curtis valve regulates the steam supply according to the height of water in the tank, city water being used to make up the deficiencies of regular operation. This extra feed is brought from the city mains in a 1¼-in. pipe, with an additional ¾-in. pipe from another street. It is also possible to feed the pump steam cylinders directly from the boilers, through a 1-in. main which is joined to a cross-connecting pipe between the steam cylinders. The arrangement of valves is so flexible that both systems may be in operation at once if desired, one pump being supplied by each high-pressure line. The engine room is about 35 ft. by 20 ft., and it also contains a hot water tank for the office service 24 in. in diameter and 8 ft. long, heated by live steam. The piping throughout the plant is arranged with unusual simplicity and directness. The two-pipe gravity heating system is employed in the building.

The single generating unit consists of a 13-in. by 12-in. American Ball horizontal non-condensing engine direct-connected to two 39-kw. six-pole General Electric direct-current dynamos operated on the three-wire system. These are wound for 113 volts, overcompounding to 118, and mounted on a single shaft running in four bearings. The normal speed is 285 r.p.m. Steam is supplied through a 5-in. main and the exhaust is carried through a 6-in. pipe to a Berryman heater, which holds the feed water temperature close to 210° F. The heater is by-passed for feed water supply.

The switchboard was built by the W. S. Hill Electric Company, of New Bedford, and installed by Edwin C. Lewis, of Boston. It consists of three panels of dull-finished black slate 1½ in. thick. All the feeder switches are of the double-throw type, the upper position being connected with the Edison circuits and the lower with the bus-bars of the three-wire generators in the plant. The horizontal and vertical bus-bars at the rear are covered with asbestos to prevent accidental short-circuits from tools, etc. The end panel toward Post Office Square is 26 in. wide and it is devoted to the elevator service, the common height of all panels being 72 in. No instruments are mounted on the elevator panel, but it carries a full complement of Noark enclosed fuses, three double-pole, double-throw switches and two triple-pole switches at present not in use. The next panel is devoted to the generator units. It carries the usual triple-pole, single-throw switch for each generator, two field rheostats, a 6-point potential switch, two triple-pole, 400-amp. main generator fuses, including the equalizer connection, and at the top two 400-amp. Weston ammeters and two Weston 125-volt meters, one for each half of the machine. This panel is 39 in. wide, as is the third and last panel, which is given up to lighting switches, of which there are six triple-pole, double-throw. The bottom of the switchboard rests upon four polished brass columns terminating in circular pedestals of the same material, a space of 12 in. being allowed between the switchboard and the floor. The Edison service is brought in over three cables through the usual service connections, including Wright demand meters. The rear of the switchboard is admirably illuminated by daylight from out of doors through a long skylight set into the Congress Street sidewalk.

There are about 160 16-cp lamps in the corridors and some 750 lights of the same size in the offices, about four lamps per office being allowed. The elevators were installed by the Whittier Machine Company and the motors and auxiliary mechanism are located in a well-lighted room next the boiler room, 30 ft. square. Three elevators are installed, all of the Otis make, with double-worm and gear and lever car switch. Each elevator will readily lift 2,000 pounds at a speed of 400 ft. per minute, the cars holding about 10 passengers each. One elevator is equipped with a back gear attachment which reduces the speed to about 100 ft. per minute for the handling of freight. Safes and other merchandise weighing up to about 5,000 pounds can be handled in this machine. The elevator motors operate compound-wound, at 220 volts direct current, and all three of the 54-in. winding drums are equipped with solenoid-operated driving brakes to prevent back lash on account of cable slackening, and give easy, quick stops. These are the first Otis elevators in Boston to be so equipped. In the temporary absence of Chief Engineer Chapman the plant is in charge of Mr. Frank G. Wright.

Erecting a Large Motor.

By William Burns.

THE electric motor, unlike the steam or gas engine, can be stowed away in almost any odd corner, as it requires very little attention, can be started and stopped from any convenient position and has no heavy reciprocating parts to jar and shake the building. It also requires very little foundation; practically the only staying required is against the pull of the belt. For these reasons, when a motor is being installed it is very often fixed near the roof to economize floor space. The motor in the heavier sizes is supported on iron or wooden beams let into the walls or affixed to columns; the smaller sizes of motors are often fixed direct to the walls or to the ceiling.

Erecting a large motor in a confined space and above the floor level is a somewhat different proposition from the fixing of the same machine on the top of a ground or a level floor. Very often to get the machine into its position it has to be taken apart, then re-erected when in position on the ground. There is no difficulty in doing this if the machine is on the floor level and there is plenty of head room, but when the machine is placed close to the ceiling, building up in position is generally impracticable. The hoisting tackle has often to be supported from the floor above, and this involves making an opening in two floors; as these openings have to be kept as small as possible, there is no way of shifting the tackle about when erecting. Of course, if the machine is not too heavy the cutting of the top floor may be avoided by hanging the tackle on some arrangement of beams and trestles on the first floor, but when we have, say, a 60 or 70 hp motor to lift, it is safer to support the load on a beam covering several of the joists on the second floor. A good, long heavy beam should be used, as it is not very easy to determine the strength of the joists in an old building, and, "'tis better to be sure than sorry." When setting up the beams to support the motor it is best to arrange the two, three or four beams so that they can be moved out of the way and allow the motor to be lifted straight up; this is also very convenient for lowering the motor should any large repair be at any time required. Further, it allows the motor to be built up directly underneath on the floor, the beams being very convenient for affixing small tackles to lift the different parts.

A machine of large size is usually built up on a soleplate, which should be got into position first; then the bottom half of the yoke and the bearings for the armature shaft, these sometimes being in one piece with the yoke. Besides these, however, on a large machine an outer bearing is fixed next to the driving pulley to sustain the pull of the belt. When these have been got into position the armature may be placed in its journals and the oil rings and brush gear fitted on. In slinging the armature it is generally possible to get a clear space on the shaft by which it may be slung, at the same time keeping the sling off the shaft journals. A short sling may be put on each end of the shaft and a piece of wood placed on the top of the armature to prevent the sling pressing on the ends of the coils.

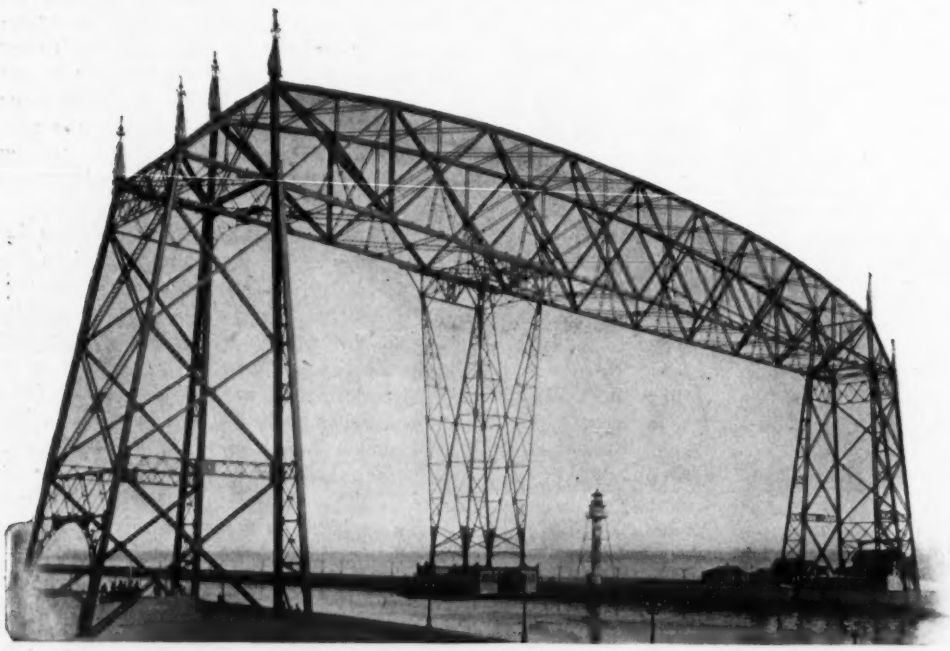
A great many erectors, however, prefer a good piece of rope for work of this nature, as it is much easier manipulated, and in the hands of an experienced man is much more reliable. For instance, in a large armature shaft the armature is seldom in the middle of the shaft; it is central between the two journals which support it, but the broad driving pulley and the outer journal have to be taken into account; and to lift the armature level, the hook of the tackle must be placed some distance from the center towards this long side, the exact position being found by trial. Low slings of suitable length are not always available and to adapt those on hand by shortening the one or the other by turns round the shaft, by a cat's paw, sheep's shank or hitching the sling on to the hook, is somewhat cumbersome and especially so if the head room is limited. On the other hand, in using the rope, the piece of wood on top of the armature is first put into position, then the hook of the tackle brought approximately to its lifting point, the toe and heel of the hook lying axially along the shaft. A clove hitch is made on the shaft when commencing lashing, leaving a fairly long, free end to tie up at the finish; upon passing the rope through the hook a similar hitch is made at the other end, and thereafter as many turns as may be thought necessary are passed through the hook and round the shaft, and the two free ends tied together. The two lashings should be crossed on the hook, thus locking them when

the stress comes on, and allowing the hook to be placed a good distance from the center of the lashing without any danger of slipping; it is also very convenient for finding the exact lifting point, as when the stress is off the hook can be easily moved to a fresh position. As the journals are usually smaller than the rest of the shaft the turns of the rope should be kept inside the clove hitch. Then there will be no trouble due to a turn slipping down into the journal.

The top of the yoke should now be lifted into position, a little soft soap being smeared on the joint surfaces close to the journals to prevent oil creeping along the joint; the journal covers are then screwed down and any other details fixed up, leaving as little to be done in position as possible. All parts liable to be injured by dirt should be carefully covered up before lifting. An eye bolt is usually provided for lifting the motor, but as the bedplate is now bolted on, the eyebolt will not give an even lift. Of course another sling or lashing can be used to carry up the heavy end; this, however, throws a strain sideways on the eye bolt, and when handling a heavy weight with a chain block the sling is often subjected to a good deal of jerky pulling, and should there be the least flaw in the eye bolt it would be almost sure to give way. A sling can generally be placed between the ribs on the end brackets or round the shaft, which forms a much safer lift; also, the slings can be kept closer together, and this is of importance when a hole has to be made in the floor. A guide rope should be fixed to one end to keep the motor from swaying about when lifting. The motor should be hoisted about one or two inches from the floor and all the slings, tackles and supports examined to see that no weak parts exist. Should all be right the hoisting can be continued till the motor is high enough to clear the beams, which should now be placed in position and bolted down. The motor can now be lowered and tried for position; if the measurements have been correct no appreciable shifting will be necessary. Leveling up should not be required, as the beams will be level. Holes for holding down bolts are now bored and all connections made. A small platform and rail should be placed round the motor for the convenience of the attendant.

Electrically Operated Aerial Ferry.

The first ferry of a novel type developed in France and which has entered into some use in Europe, has recently been finished and put in operation at Duluth, Minn. As will be noted from the accompanying engraving, the ferry consists of a car suspended from a bridge structure, the car being hauled to and fro between the shores, in the present case electric power being employed for this purpose. The ferry is across the Duluth ship canal through which there passes annually a commercial tonnage equal to that carried through the Suez Canal. Heretofore the traffic across the canal was accommodated by a steam ferry. This was, however, found expensive, and the United States War Department refused to approve of successive plans for a drawbridge, a lift bridge and a roller bridge. A tunnel was also proposed, but it was found that the cost of its construction would be prohibitory. The cost of the steam ferry was $11,000 per annum, and it is estimated that the annual cost of the aerial ferry, owing to the use of electric power, will not exceed $8,000 per annum, including operation, maintenance and interest on bonds.



ELECTRICAL AERIAL FERRY AT DULUTH.

The ferry bridge has a clear height above the water of 135 ft. and a clear span of 394 ft. The car platform is 34 by 50 ft., and provides space for a street car, two wagons and two passenger cabins, each 7 by 30 ft. Its carrying capacity is 125,000 pounds and the normal speed of operation is four miles an hour, though the electrical equipment will permit a speed double this.

A 40-hp, 500-volt General Electric railway motor, controlled by a railway controller, is secured by means of brackets under each end of the car. Each motor is geared to a 9-ft. cable drum, one of which hauls the car in one direction and the other in the opposite direction. One-inch cables from these drums extend overhead to 9-ft. idler wheels on a suspension truck on the bridge and thence to the ends of the bridge, where they are fastened. The track carrying the car and the idler is enclosed on three sides within the box section of the lower chord of the bridge, thus shielding it from snow and sleet in the winter time. The suspension truck is carried on four rails and has 32 wheels, eight bearing on each rail. The bearings of the wheels as well as those of the drums and idlers are fitted with ball end-thrust bearings. To provide for an emergency, the drums in the car are fitted with a hand gear by means of which they may be operated. Current is supplied at 500 volts from two sources, the mains of the Central Lighting Company and the feeders of the street railway company. The trolley wires, one for each of these sources of supply, are supported by the usual electric railway overhead fittings, and a switch under the control of the motorman enables him to switch over from one source of power to the other. All wiring for motors and lights is installed in iron-armored conduit. In one of the waiting rooms a neat cabinet is installed containing the wattmeters and switches for the light, power and signal systems. The average power used for moving the car is 18 hp. In a broadside wind of 60 miles per hour a deflection of the car of but 1 7/16 in. was noted.

The bridge was constructed by the Modern Steel Structural Company, of Waukesha, Wis., and the electrical equipment was installed by the Mutual Electric Company, of Duluth. We are indebted to Mr. Norton Mattocks for the information contained in this description.

Ignition of Coal Dust by Electric Lamps.

A recent issue of *Mines and Minerals* contains an account of experiments with reference to the ignition of coal dust by electric lamps. When an incandescent lamp is placed on coal dust, either uncovered or partly covered, heat is generated very rapidly. In one case, with a slight covering of dust, the temperature rose in ten minutes to 370° F., and in four minutes the lamp exploded at a temperature of 450°. The highest temperature registered was 650°. In two of three experiments the coal dust was found to be red hot on poking into the dust, although the lamp had been removed some time. The interesting part of these experiments resides in the fact that when the heat has been raised to a certain temperature the action of spontaneous combustion begins to operate, and the temperature continues to increase until fire is reached, although the lamp may have been removed. These phenomena indicate that unless care is used in placing the lamps there is some danger of underground fires and a liability that fire damp may be ignited by the explosion of a lamp. The temperature at which coal dust will begin to develop spontaneous combustion has not as yet been determined.

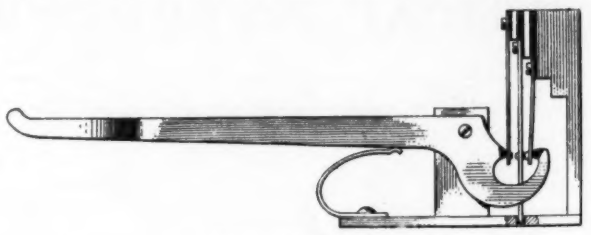
New Telephone Patents.

AUTOMATIC LISTENING DEVICE.

Numerous inventors have struggled with the problem of the automatic keyboard for manual switchboards. A step in this direction has been patented by J. W. Lattig and C. L. Goodrum, of Philadelphia, this being an automatic listening device for the operation. The arrangement includes two switching relays, one associated with the answering plug of each cord pair and arranged to cut the operator's set upon the pair; and the second associated with the calling plug to cut the set clear of the cord pair. It is evident at once that this system in its present state has no flexibility. The patent is assigned to the Eastern Telephone Manufacturing Company.

NEW HOOK SWITCH.

The accompanying illustration shows a type of hook switch patented by J. McK. Clement, of Mineralbluff, Georgia. Mr. Clement



CLEMENT HOOK SWITCH.

has made several different designs of this hook, the distinctive features of which are a stationary middle spring and movable spanning springs, each operated by the lever.

SELECTING TRUNK SYSTEM.

It is well known that a large group of trunks is more efficient than a small group. In order to keep the efficiency to a maximum Mr. E. Sand has produced a selecting trunk system. By this system all trunks between any two points are arranged in a single group, irrespective of the number of operating positions necessary to handle them. Then in order to make any trunk available for all positions, a number of selective devices similar to the selectors of an automatic switchboard are associated with each operator's position, wired to trunk jacks. There are just enough of these jacks and associated selectors to handle the traffic from that position. When a call is to be forwarded the operator inserts a plug in any available jack of the desired group and the selector selects the first available, i. e., "non-busy" trunk line.

COMPOSITE SYSTEM.

Mr. C. Turchi, of Italy, has patented a composite system in which the telephone branch of the circuit is bridged off the line and split between two circuits, each led through a condenser and through one of the winding bridges of a differential coil. One of the branches, in addition, contains an adjustable inductance. The telephone proper is connected to an independent winding of the differential coil which overlays the two opposed primaries. Transmission is regulated by the unbalancing of the two branches of the bridged circuit by properly adjusting their relative inductance.

SELECTIVE SYSTEMS.

A novel selective device has been patented by C. R. and D. R. Green, of Rising Sun, Indiana. This consists of a relay which is under control of either the operator or the stations, and by means of which the branch subscribers' circuits may be connected to or disconnected from the main line at will. Another selective device is of the step by step nature invented jointly by Messrs. N. S. McKinsey and A. R. Nelson, of Susanville, Cal. The mechanism is driven by a clockwork under control of either the subscriber or of electromagnetic means operated from the central office.

COMBINED PRIMARY AND SECONDARY CUT-OUT.

Many are familiar with the secondary cut-out button of telephone sets, once almost universally furnished, but now almost entirely obsolete because of the skill required to handle it satisfactorily. This button was wired to short-circuit the secondary of the induction coil and thus cut out extraneous transmitter noises. Mr. C. Adams-Randall, of New York City, has gone this one better by producing and patenting a cut-out whereby the receiver is cut out and transmitter is in one position and vice versa. This cuts out inside tones, as well as extraneous noises.

LETTERS TO THE EDITORS.

Coal and Power in South Africa.

To the Editors of Electrical World and Engineer:

SIRS:—Permit me to correct a somewhat misleading paragraph which appeared in your issue of July 1, under the heading "Power Transmission in South Africa." One would infer from it that coal is so expensive in Johannesburg as to warrant electrical transmission thither from the Victoria Falls, a distance of 1,100 km. (680 miles) at 70,000 volts. The fact is that fairly good coal (having about 80 per cent of the calorific value of Welsh) costs delivered in bunkers at the mines in car load lots from $3 to $4 per ton. The principal central electric power station serving Johannesburg and the adjoining mines buys its coal at about 60 cents per ton at the pit's mouth, which is about 20 miles from the town. All-day power can be contracted for at a trifle over 3 cents per kw-hour, and many mines generate at a cost of 2½ to 3½ cents with not unusually good load factors. Electrical transmission of power from Victoria Falls is evidently not to be considered as commercially possible.

JOHANNESBURG, SOUTH AFRICA. J. W. KIRKLAND.

A Prize for a Prophet.

To the Editors of Electrical World and Engineer:

SIRS:—As an amateur farmer, I am interested in the weather. I have gathered meteoroligical data for years, but as yet have not found the slightest basis on which to ascertain the state of the weather, even twelve hours ahead.

The Government weather predictions are very faulty, and as many laymen claim they can predict the weather more accurately than the weather bureau, without any of the elaborate apparatus of the Government, I hereby appeal to all the weather prophets of this country to enter a thirty day contest for a cash prize of one hundred dollars, which I will give to whoever predicts the weather most accurately and will tell for the benefit of the public by what methods he arrived at his conclusions.

NEW YORK CITY. F. R. FAST.

Electricity in Agriculture.

To the Editors of Electrical World and Engineer:

SIRS:—I wish to call your attention, as the editors of the leading periodical of the world devoted to electricity in its numerous applications, to a matter of great importance to both the electrical industries and to the agricultural interests of the whole country.

Since July 1 I have written to the Congressional delegations of many States, urging them to take active measures, at the coming session, to obtain an adequate appropriation for making experiments in the application of electricity to agriculture, plowing, threshing, etc. It certainly is a strange thing, as I wrote recently to Prof. E. J. Houston, that fifteen years after the masters of applied science freed the horse and mule from grinding servitude in the city streets as the sole motors of the cars of the traction companies, no Lincoln has yet appeared to emancipate them from their weary labor in the fields of the farmer, although in the one case the power is mainly derived from high-priced coal, burned in costly steam plants, while in the other it may be had at a mere normal cost from the water power so abundant in so many parts of our wide extended country.

I have been of the opinion that Congress should make such appropriations ever since I first learned, more than a dozen years ago, of the large quantities of power produced by the dams of the irrigation companies, such as that of the Redlands Company, of California, located 8,400 ft. above the sea. I notice in the catalogue of the Pelton Water Wheel Company that this power is now utilized by the Los Angeles Edison Electric Company, of California, by means of a turbine working under a head of 192⅜ ft.

Besides these artificial sources of water power, there is the great Snake River of Idaho, which is a succession of high falls. The Twin Falls, Lavel & Water Company has along its 270,000 acres on the Snake River, at the Twin (186 ft.) and Shoshone (210 ft.) Falls 100,000 hp, and has just put in a 20,000-hp plant. It is safe

to assume that any of these great companies would be more than willing to supply power gratis for such experiments which, therefore, could be carried on at small cost.

The mountain regions of the Southern States in Virginia, West Virginia, North and South Carolina, Georgia, Alabama, Tennessee and Kentucky are admirably situated to take advantage of this scheme by means of the high head impulse wheel which is so admirably fitted to develop power from either a large stream or a small one.

In this region we are interested in the scheme of the Keokuk & Hamilton Water Power Company to dam the Mississippi at the foot of the Des Moines Rapids, at a cost of $6,000,000, to raise the river 30 ft., and produce 60,000 hp. This power could be conveyed over an area of 125,000 square miles—twice the size of Illinois and 15,000 miles to spare, in Iowa, Illinois and Missouri in the very best part of the corn belt.

Engineers are studying the details of a similar scheme at the Falls of the Ohio at Louisville, where at low water the river drops 26 ft., to produce an average of 38,000 hp. The same extent of territory could be covered from this center and from Niagara and the "Soo." It is proposed to dam the Tennessee at Muscle Shoals for the same purpose, and I doubt not that many another large Southern river will before long be treated in this way.

I have had many letters of approval and now arrive by every mail. From 1893 till about 1901 I searched the index of the ELECTRICAL WORLD AND ENGINEER for notices of electric plowing experiments and found many, all "made in Germany." I think it is high time that this odious German label should be removed in a branch of applied science where otherwise we Americans stand first.

BARRY, ILL. E. W. BAKER.

DIGEST OF CURRENT ELECTRICAL LITERATURE

DYNAMOS, MOTORS AND TRANSFORMERS.

Preventing Sparking in Alternating-Current Commutator Motors.—A description of a method of Zani which consists in providing the stator with auxiliary poles, in addition to the main field poles, so disposed that when a coil of the rotor is short-circuited it will embrace, in addition to the flux due to the main field, a flux due to auxiliary poles of such direction and intensity as to counteract the action of the flux due to the main field. The stator *a* (Fig. 1)

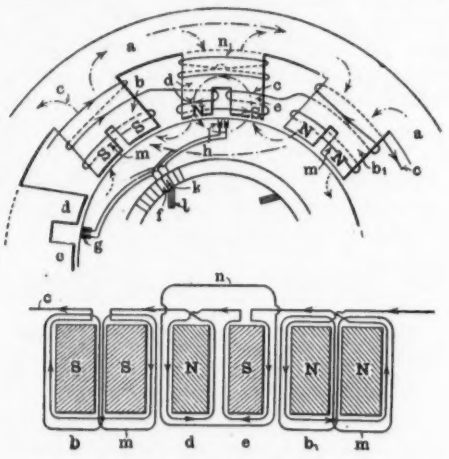


FIG. I.—PREVENTING SPARKING.

is provided with main poles, *b*, *b*¹, etc., wound with continuous coils *c*, so as to produce alternate N and S main poles. Between the main poles *b*, b_1, etc., the stator is provided with auxiliary poles, *d*, *e*, between consecutive main poles; the pole *d*, nearer to the S pole *b*, is wound as a N pole and the pole *e* as a S pole. The rotor is provided with a winding partly shown in Fig. 1, the path of current being from the commutator bar, *f*, through the conductor, *g*, across the back of the rotor to the conductor, *h*, and through the conductor, *h*, to the commutator bar, *k*. Under these circumstances the conductors short-circuited by the brush, *l*, embrace the flux due to the pole *b*, and the two auxiliary poles, *d*, on each side of it, and it will be seen that the flux due to the auxiliary poles will counteract the flux due to the main pole and prevent the flow of current in the short-circuited coil. The illustration shows an additional short-circuited winding, *m*, on the main poles for the purpose of keeping uniform the distribution of the flux over the main polar surfaces. On the auxiliary poles is also shown a single short-circuited winding, *n*, embracing a pair of poles; this coil is useful in preventing leakage of the main flux between the main poles through the auxiliary poles. This short-circuited coil will not affect the flux due to the auxiliary pairs of poles, *d*, *e*. In the case of a two-pole machine there will be two sets of two auxiliary poles; for a four-pole machine there will be four sets of two auxiliary poles, and so on.—Lond. *Elec.*, Aug. 25.

Calculation of Three-Phase Induction Motors.—SUMEC.—A mathematical article, illustrated by diagrams, discussing several special problems in the calculation of induction motors. The discussion is quite thorough in various details, and rules are given on the design of such motors, with numerical examples.—*Zeit. f. Elek.* (Vienna) Aug. 27.

Separating Losses of Machines.—ROEHLE.—An illustrated article describing a method of separating the losses in the bearings and the air friction losses of rotating machinery from the form of the curve giving the decrease of speed when the circuit is broken.—*Elek. Zeit.*, Aug. 24.

Removal of Asbestos from Armature Leads.—WEEKS.—A short article describing a device which has been found useful in removing asbestos from armature leads.—*Amer. Elec.*, September.

LIGHTS AND LIGHTING.

Street Lighting.—A report on street lighting in Croydon, giving results of tests of various lamps with a statement of the comparative cost. The figures given are the average total cost in cents per cp-year:

	Cents.
Electric arcs, direct connected, 520 watts, alabaster globes	17.40
Electric arcs, alternating current, 650 watts, half opal globes	17.92
Electric arcs, alternating current, 450 watts, half opal globes	29.18
Electric arcs, alternating current, 500 watts, half opal globes	31.88
Electric arcs, direct current, 690 watts, alabaster globes	17.40
Nernst lamps, ½ ampere	29.32
Incandescent gas lamps	24.90
Croydon Gas Company	31.58
South Suburban Gas Company	31.64
Alternating-current flame arc, 550 watts, opalescent globe	6.15
Santoni lamp, 430 watts	7.34
Incandescent lamp with Reason fittings	24.63

In its conclusion the committee finds that gas lighting has been considerably improved by means of high-pressure lamps, but although these advances have been made, so long as the price of electric arc lamps does not exceed a certain amount, the cost of lighting by means of the ordinary direct-current arc lamps should be more economical than by the high-pressure gas lamps. The committee also find that considerable improvements have been made with electric arc lighting. This has been primarily brought about by the introduction of a new type of arc lamp known as the "flame arc lamp."—Lond. *Elec.*, Aug. 25.

POWER.

Braking of Electric Lifting Motors.—A description of a new form of brake gear made by L. Scott & Co. Two brake shoes are held against opposite sides of a drum on the motor-shaft by the tension of one or more spiral springs. These shoes are connected by levers to movable cast-steel plates, which form part of the magnetic circuit of the motor. When no current is supplied to the motor the springs hold the brakes "on," the steel castings being then kept by the levers a slight distance from the framing of the motor. Fig. 2 shows the construction of a 95-hp haulage motor for 500 volts at 430 revolutions per minute. The greater part of the iron is removed from around the roots of two of the pole-pieces, so that the magnetic flux meets with a gap of high reluctance, and passes by preference through the cast-steel plates, which are situated opposite the gaps. These plates, therefore, close in to the sides of the motor immediately when the current is switched on, holding off the brakes and bridging the gaps in the magnetic circuit. In the case of a series motor if the current falls, the brakes will gradually come on again, and prevent the machine from attaining an ex-

cessive speed. As, however, a small fraction of the full-load current is sufficient to keep the brakes off, they do not interfere with the speed variation, which is so valuable a feature in series motors for general lifting purposes. The amount of the "holding off" current can be varied according to circumstances, and with a slow-speed motor which is recommended for lifting purposes, the brakes are arranged not to go on until the speed of the motor has increased to about three times its normal. With high-speed motors

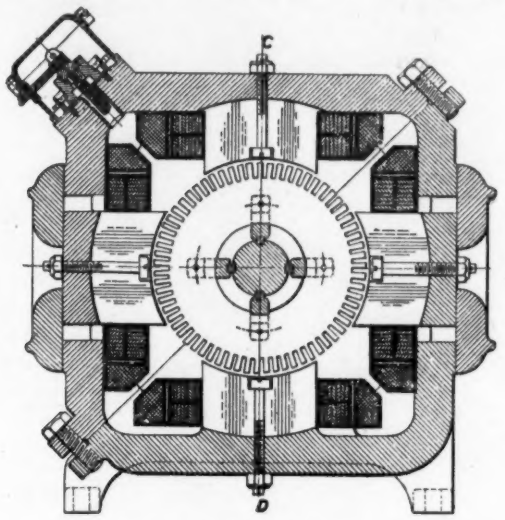


FIG. 2.—BRAKING MOTORS.

this would not be safe, so that the brakes are caused to go on with a larger fraction of the full-load current. The latest improvement in these brakes is the arrangement enabling them to be taken off by hand when required. In Fig. 3 it will be seen that

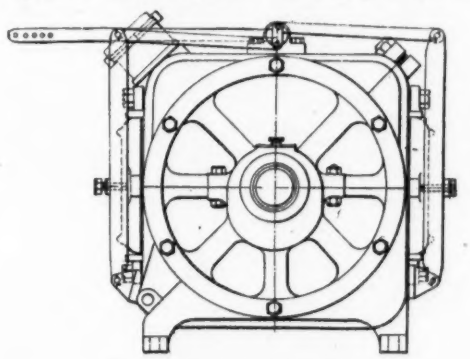


FIG. 3.—BRAKING MOTORS.

a pair of levers, hinged at their lower ends, engage the steel plates in the middle, and at their upper ends are linked to a toggle in the center of the framing. The toggle is operated by a hand or foot-lever. When it is desired that the entire control of the motor should be effected by a single handle, a similar system of levers is employed, operated by a cam on the reversing controller. The cam has a slow rise, so that as the controller is moved into its lowering position the brakes are gradually taken off before current is switched on. If, when the brakes are off, the load does not start itself, the controller is moved one step further, switching current on to the motor through a resistance.—Lond. *Eng'ing*, July 7.

French Waterpower Station.—RYAN.—An illustrated description of the Saut Mortier transmission plant which is located in the Jura region, a mountainous district lying in the eastern part of France and next to Switzerland. Four 700-hp turbo-driven alternators deliver 50-cycle, three-phase currents at a terminal voltage of 7,500. Four main transmission lines run from Saut Mortier and cover a considerably extended territory in the Jura region. The total length of the high-tension overhead lines, starting from the station, may be reckoned at 70 miles. The lamps and motors in the different towns are supplied by secondary circuits, and the transformers are installed in kiosks built of cement. In order to supply current for the locality of St. Claude, where the number of lamps and motors is considerable, there has been erected a sub-station containing a number of motor-generating groups.—*Amer. Elec.*, Sept.

Turbo-Electric Drive in Paper Mill Service.—BIBBINS.—An article pointing out that the steam-turbine is specially suitable as a prime mover for pulp and paper manufacture, and giving the experience of the West Virginia Pulp & Paper Company. There are two steam turbines of 1,000 kw running at 1,800 revolutions per minute. Three-phase current of 20 cycles is generated at 440 volts. The total motor load connected is 4,920 hp. The installation is described in detail and illustrated.—*Eng'ing Record*, Sept. 2.

Hydraulic Accumulation Plant.—HERZOG.—A very long detailed illustrated description. In order to utilize, during the night, the water power plant of the Alten-Aarburg works, there has been installed a hydraulic storage system operated by centrifugal pumps. *Elek. Bahnen*, Aug. 4, 14, 24.

Hydraulic Installations.—BARR.—An illustrated article on water-power machinery and accessories.—*Eng'ing Mag.*, September.

Power Plant.—HARDESTY.—An illustrated description of the electric light and power plant of Brigham City, Utah. Water power is used to drive a 350-kw generator running at 300 revolutions and giving three-phase currents at 60 cycles per second. The voltage between each phase is 4,150.—*Eng'ing News*, Sept. 7.

Electric Power in the United States Navy.—BROOKS.—An illustrated article describing in detail the various motor applications on board the warships of the United States Navy. Diagrams are given showing how the motors are coupled to the various auxiliary machinery.—*Amer. Elec.*, August.

Boiler-Room Trouble.—HENRY.—A short article describing the troubles encountered by the writer, and the remedies applied in the boiler room of a western street railway plant.—*Amer. Elec.*, Aug.

Stoker.—An illustrated description of an improved revolving-chain-grate automatic stoker especially applicable for furnaces of steam boilers, refuse destructors, etc.—Lond. *Elec.*, Aug. 25.

TRACTION.

Three-Phase Electric Railroad.—Some notes on the electric trunk railroad from Vienna to Pressburg which will be operated within the city limits by direct-current and outside by three-phase currents. It is intended both for passenger and freight service. The partial line from Vienna to Gross Schwechat will probably be opened during this year, while the whole line will be finished next year. The total length will be 70.5 km. In Vienna the municipal electric station will furnish the direct-current, while for the road between the two cities a three-phase power station is being erected in Regelsbrunn, at the central point of the line. For passenger service motor cars will be used, for freight service electric locomotives.—*Elek. Bahnen*, Aug. 4.

Direct-Current, Single-Phase Motor Car.—RICHTER, CRONBACH.—Some notes on the description of a motor car of the Allgem. Elek. Ges. which is operated both with direct-current and alternating current, as recently noticed in the Digest. Winter-Eichberg motors are used. The brushes which carry the exciting current for the alternating-current operation of the motor, carry during direct-current operation the real load current; that is, the current which with the exciting field gives the torque of the motor. The stator winding which supplies the load current to the armature by inductive action during the alternating-current operation, serves as field winding during direct-current operation. A second stator winding, which is not used in the Winter-Eichberg motor when operated by single-phase, compensates the armature flux. Richter makes some remarks concerning sparking of the commutator. Cronbach replies that the short-circuit brushes are not taken off during direct-current operation. There are no resistances in the connections between commutator segments and armature windings. Nevertheless, it is a fact that the operation of the motor with alternating-current is sparkless. Richter concludes that under these circumstances the e.m.f. produced by pulsation of the alternating-current exciting field in a short-circuited coil is smaller than that induced by rotation in the direct-current exciting field. In other words, an ordinary series motor without any device for preventing sparks at the brushes and with the same dimensions as the Eichberg motor would also run sparkless at the same frequency (40 per second) and with the same exciting field. It would, therefore, be possible to replace the motor by a simple series motor.—*Elek. Bahnen*, Aug. 4.

Insulation Resistance of Third Rail.—On the Berlin electric elevated and subway the following insulation resistances of the third rail against earth were found: First section, 4.2 km length (elevated), 2,000 ohms, corresponding to 8,400 ohms per km. Second and third sections, 7 km length (elevated), 6,116 ohm, corresponding to 42,812 ohms per km. Fourth section, about 3 km length

(tunnel), 29,400 ohms or 88,200 ohms per km. Fifth road, 5.2 km length (tunnel), 28,550 ohms, corresponding to 148,460 ohms per km. These insulation resistances are considered satisfactory, except on the first road where a fault is believed to exist.—*Elek. Bahnen*, Aug. 24.

Third-Rail.—An illustrated description of the new under-contact third-rail which will be used in the New York electrical zone of the New York Central Railroad.—*St. R'y Jour.*, Sept. 2.

Electric Tramway Statistics of Austria and Hungary.—Two statistical tables. On December 31, 1904, there were in operation in Austria 32 electric railways with a total length of 573 km. The largest system is that of the Vienna municipal electric railways with 184 km, while the system of the Vienna Local Railway Co. covers 42 km. In Hungary there were three electric interurban railways with a total length of 172 km.—*Zeit. f. Elek.* (Vienna), Aug. 13.

INSTALLATIONS. SYSTEMS AND APPLIANCES.

Synchronous Converters in Parallel with Batteries.—JAKOBI.—If a battery is connected in parallel with a generator in order to equalize the load, the action depends on the fact that the battery itself has a low internal resistance while the dynamo has a relatively high internal resistance and does not operate with constant voltage. With a synchronous converter changing three-phase currents into direct-current, however, the voltage of the direct-current remains constant as long as the secondary voltage of the three-phase transformer which is connected to the three-phase side of the synchronous converter, remains constant. In order to use a storage battery in parallel with the direct-current side of the converter Siemens & Halske have devised the arrangement shown in Fig. 4,

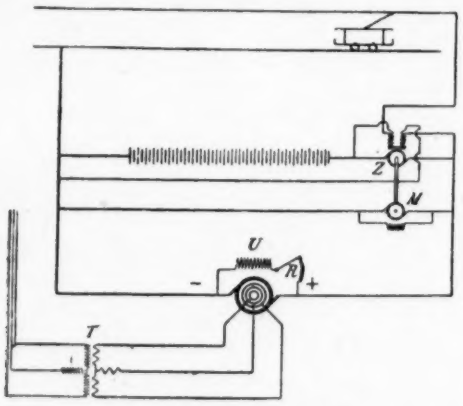


FIG. 4.—DIAGRAM OF CIRCUITS.

which employs a constantly-running booster. The dynamo, *Z*, is driven by the motor, *M*. The dynamo, *Z*, has two exciting windings, the actions of which are opposed to each other. Through one of these windings the total current of the network passes, while the other winding is connected to the terminals of the battery. If the load is such that the current in the network equals the maximum current supplied by the converter, *U*, the actions of both

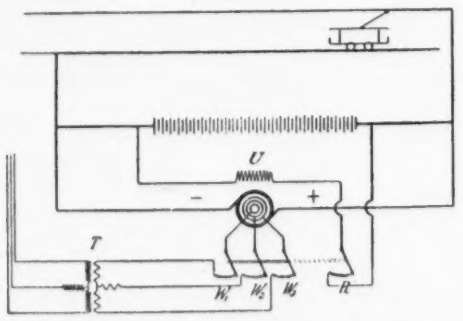


FIG. 5.—DIAGRAM OF CIRCUITS.

windings compensate each other and the battery is neither charged nor discharged. If the load rises, the winding through which the main current flows is stronger than the other winding and the dynamo, *Z*, is so excited that the battery discharges. If, on the other hand, the load decreases, the battery is charged. In connection with the street railway system of Remsheid two machines are used instead of the one booster. An auxiliary machine is provided with the two magnetic windings and gives the exciting current for the shunt excitation winding of the dynamo. It is, however, possible to avoid the use of a booster entirely. An arrangement for this purpose is shown in Fig. 5. The method is based on the fact that the direct voltage has a fixed ratio to the three-phase voltage with which it is supplied, so that it is sufficient automatically to change this three-phase voltage. This is done by means of the three rheostats, W_1, W_2, W_3, which are coupled together so that the change of resistance in each of the three phases is the same. The exciting current for the converter, *U*, is provided directly from the battery. The rheostat, *R*, in this circuit, may also be coupled with the rheostat, *W*. In this way for any load the correct excitation and unity power factor are obtained.—*Elek. Zeit.*, Aug. 24.

Australian Central Station.—An abstract of the report for last year of the electric central station of Melbourne, Australia. The total number of kw-hours sold was 3,981,698. The total works cost per kw-hour sold was 2.796 cents, the total cost, excluding capital charges, 3.228 cents; the total costs, including capital charges, 5.278 cents. Considering the excellent load factor of 26.7 per cent, the works cost of 2.796 cents per kw-hour is high. This is explained to a large extent by the coal cost of 1.352 cents and the wages cost of 0.664 cents. Both fuel and labor are expensive in Australia. —Lond. *Elec.*, Aug. 18.

Lightning Arresters.—NEALL.—An illustrated description of present American practice in lightning arresters for high-voltage transmission circuits. The following types are described: First, non-arcing-multigap-pyramid; second, non-arcing-multigap, with resistances and multiplex arrangement; third, non-arcing-multigap, with non-arcing metal, series, and shunted gaps (so-called low-equivalent lightning arresters); fourth, horn-lightning arresters. The experience of three American companies with the latter type is described. They consider this type as very satisfactory for heavy discharges; the chief objection is the length of time the arc holds on after the discharge to ground (a second or a second and a half); considerable disturbances are created on the system when they discharge.—*Elec. Jour.*, August.

Time-Limit Relays.—FERNANDEZ.—An illustrated article describing the clock type of time-limit relay and bellows type of time-limit relay. The author points out the advantages and disadvantages of the two types, and gives methods for testing and installing them.—*Amer. Elec.*, September.

Electric Connections.—BERNARD.—Some illustrated notes describing the various cases in which electrical connections may be made by snap clasps similar to those used for the snap buttons of gloves.—*Elek. Zeit.*, Aug. 24.

WIRES, WIRING AND CONDUITS.

Calculating Networks.—LI GOTTI.—An article illustrated by diagrams on a simple method for calculating distribution networks. —*L'Eclairage Elec.*, Aug. 26.

ELECTROPHYSICS AND MAGNETISM.

New System of Units.—ROSSI.—A paper in which the author recommends that the quantity of electricity should be made a fundamental unit of the same rank as length, time and mass, and possibly more fundamental than mass. Its unit is indicated by *E*. On the new system, electric current becomes ET^{-1}, difference of potential $ML^2T^{-2}\ XE^{-1}$, and resistivity $ML^3T^{-1}E^{-2}$. The last quantity may be analyzed as follows: On reversal it becomes conductivity $M^{-1}L^{-3}TE^2$. This may be written $(EM^{-1})\ (EL^{-3})\ (T)$. The first of these quantities is the familiar ratio e/m, or the ratio of the charge of the electric carrier to its mass. This is also the acceleration in unit field. The second quantity is the density of electricity in the material, and the third quantity, *T*, may be regarded as the time during which the electron is, on the average, free to follow the impulse of the field; in other words, the time of traversing its mean path. It is obvious that the product of these three quantities gives the rate at which electricity is conveyed under the impressed e.m.f. This is simply another way of stating that the conductivity is measured by the current traversing a conductor of unit cubical dimensions when subjected to unit e.m.f., and Ohm's law follows as a consequence of the viscous resistance encountered by the electrons in moving through metals.—Lond. *Elec.*, Aug. 25; from *Nuovo Cimento*, May.

Alternating-Current Electromagnets.—UNDERHILL.—An article il-

lustrated with diagrams on the calculation and design of magnets for operation on alternating-current circuits.—*Amer. Elec.*, Sept.

ELECTROCHEMISTRY AND BATTERIES.

Electrolytic Valve.—HOLTZ.—An account of experiments in which he determined the "valve effect" of a large number of different electrodes. He used electrodes having a surface ratio of 1:200, and sent currents alternately in the two directions. Most cells show some kind of valve action, even tin, zinc, carbon and platinum, in dilute sulphuric acid. But very decided valve action is shown only by aluminum, copper, cobalt, antimony and bismuth. Aluminum immersed in aluminum chloride shows currents in the ratio of 88 to 3, but in this case the anode must be smaller for the larger current, instead of the cathode, as in sulphuric acid. Copper in chloride of copper shows a similar ratio, but in this case the cathode must be smaller for the larger current. Cobalt shows the reversed aluminum effect in dilute sulphuric acid, whereas antimony and bismuth shows the normal effect. This is very high in the case of antimony, the ratio of the currents in the two directions being about 100 to 1, so that an antimony cell may be used as an effective rectifier. In some of these effects are due to a layer of oxide, the others must be due to a film of hydrogen.—Lond. *Elec.*, Aug. 25; from *Phys. Zeit.*, Aug. 1.

Laboratory Appliances.—KELLER.—The first part of a fully illustrated description of labor-saving appliances in the Baltimore laboratory of the Anaconda Copper Mining Company. The devices described in this installment refer to conveniences for handling beakers and acids, stirring machines and filtering apparatus.—*Electrochem. and Met. Ind.*, Sept.

UNITS, MEASUREMENTS AND INSTRUMENTS.

Measuring Slip of Induction Motors.—DRYSDALE.—The author gives a concise summary of the different methods for measuring the slip of an induction motor. They are divided into four classes: First, speed measurement; second, contact methods; third, measurement of frequency of rotor currents; fourth, stroboscopic methods. He considers that a direct-reading slip indicator would be far more convenient, and describes a simple arrangement by which the slip at any instant can be directly read. As shown in Fig. 6,

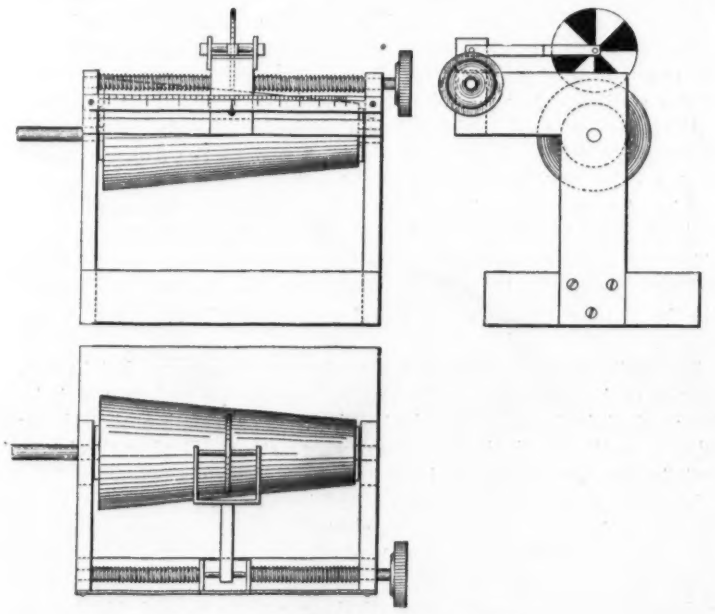


FIG. 6.—DIRECT-READING SLIP INDICATOR.

it consists simply of a conical roller of boxwood which rotates with the motor, and upon which rests a pivoted disc, which rolls upon the surface of the roller. The disc can be traversed along the whole length of the roller by a screw and guide, while its position is given by a scale. In order to arrange for both positive and negative slips to be read, the diameter of the disc is made intermediate between the diameters of the two ends of the roller. By attaching a disc of paper with black and white sectors of numbers equal to the polarity of the motor to be tested to the pivoted disc, and illuminating it with an arc or glow lamp from the source of supply, the disc can be traversed along the roller until the figure appears stationary. To enable the readings to be taken with the greatest possible convenience the scale may be made direct reading. If D is the diameter of the disc, d_1 and d_2 the diameters of the small ends of the roller respectively, l the length of the roller, N and n the synchronous and motor speeds, respectively, and x the distance of the disc from the position corresponding to no slip,

$$\text{we have slip per cent} = S = 100\ (N-n)\ /N, \text{ and } x = \frac{D_1}{d_2-d_1}\ \frac{s}{100-s},$$

from which x can be calculated for various positive and negative values of the slip and the scale divided off. In order to set the zero of the scale accurately and check the calibration if desired, the simplest plan is to attach a second disc to the end of the roller shaft with radial slits in it. If the roller is then run by a motor at any speed, and the rolling disc is observed through the slits, or by means of a lamp behind the slotted disc, the figure on the rolling disc is seen and the zero of the scale is set to the position where the figure remains stationary. If then a counter is attached to the roller shaft and the disc traversed to any reading of the scale, we have only to count the number of revolutions of the figure while the roller makes, say, 1,000 revolutions to get the actual slip, which may be compared with the scale reading. The advantages of this device are that it is applicable to all motors by simply changing the figure on the disc, that no time is lost in counting, that no calculation or knowledge of the synchronous speed is necessary, and that on an unsteady brake the observer can watch the fluctuations and observe the slip at the moment the balance is correct. The author recommends to determine the speed of a motor by deducting the slip thus measured from the synchronous speed as given by a frequency meter.—Lond. *Elec.*, Aug. 25.

Meter-Testing Method.—CORNWALL.—In all meter testing departments it is customary to test any meter when returned to stock and find its error percentage. If this error is within certain limits and the meter is otherwise satisfactory, no further testing is needed. If, on the other hand, it is found to be running either fast or slow beyond the allowable limit it becomes necessary to recalibrate it. The author outlines a method for testing meters which he has worked out and found to be entirely satisfactory, giving accurate results and saving a great amount of time.—*Amer. Elec.*, September.

Electricity Meters.—GERHARDI.—A continuation of his illustrated serial. Of double tariff meters, those of Aron, of the Electrical Company and of Hookham are described. The author then passes over to a description of maximum demand indicators and describes the Atkinson indicator.—Lond. *Elec.*, Aug. 25.

TELEGRAPHY, TELEPHONY AND SIGNALS.

Electrolytic Wave Detector.—FERRIE.—An account of experiments with the electrolytic detector which has already been used in wireless telegraph systems. A platinum wire 0.01 mm in diameter just dips into sulphuric or nitric acid, and the cell is placed in a telephone circuit. A train of incident waves may be "read" in the telephone over some 12 miles. But the sensitiveness of the apparatus may be considerably increased by introducing an e.m.f. into the circuit with its positive pole joined to the platinum. The sensitiveness increases with the e.m.f. as long as the latter remains below the point at which electrolysis set in. This point can be ascertained by means of a potentiometer. When it is passed, a continuous hissing is heard in the telephone. If the latter is replaced by a ballistic galvanometer, every wave-train is indicated by a deflection, which is reversed on introducing the e.m.f. This curious fact may be explained on the assumption of a depolarizing current. When at rest the e.m.f. produces a counter e.m.f. of polarization in the detector cell, which forms a kind of condenser subject to discharge by impinging waves, the necessary conductivity being created by a kind of coherer action.—Lond. *Elec.*, Aug. 18; from *Comptes Rendus*, July 31.

MISCELLANEOUS.

Austrian Association of Central Stations.—An account of the recent general meeting of the Austrian Assoc. of Central Stations. This association is one year old, and comprises 46 members which represent 62 central stations. Among the things discussed was the theft of electric current, which is stated to occur frequently. Singer reported on a method of preserving wooden poles, which is said to be used quite often in Norway. A hole is made

in the ground two feet deep, and 110 to 140 grams of crystallized copper sulphate are thrown into the hole. The pole is then set into the hole. The water in the earth dissolves the salt and it enters gradually into the pores of the wooden pole which get finally a green color. From time to time new copper sulphate is thrown into the earth. The method is said to have given good results. Niethammer read a paper on steam turbo-dynamos which elicited a long discussion. Scheinig installed in Linz in 1901 a 300-kw steam turbo-generator which gave such good results that another generating set of 500 kw was installed in 1904. He called special attention to the very slight attendance which turbo-generators require.—*Zeit. f. Elek.* (Vienna), Aug. 20.

Electrical Laboratory.—An account of the equipment of the new electrical laboratory of the Institute of Technology at Dresden, Germany.—*Zeit. f. Elek.* (Vienna), Aug. 13.

Atlanta-Marietta Single-Phase Railway.

Between the cities of Marietta and Atlanta, Georgia, there has recently been placed in operation the first single-phase railway to be equipped in the South. This railway, which is owned by the Atlanta Northern Railway Company, is constructed over a private right of way which runs parallel to the tracks of the Western & Atlanta Railway. The interurban line makes no attempt to conduct a local service, although the cars enter the city of Atlanta over the tracks of the Georgia Railway and Electric Company.

Within the limits of Atlanta, girder rails are used. The track on the interurban section consists of 70-lb. T-rails laid on ties ballasted in the slag, the construction being exceptionally good. The maximum grade is three per cent, and the shortest curve has a radius of 574 feet. The gauge is standard.

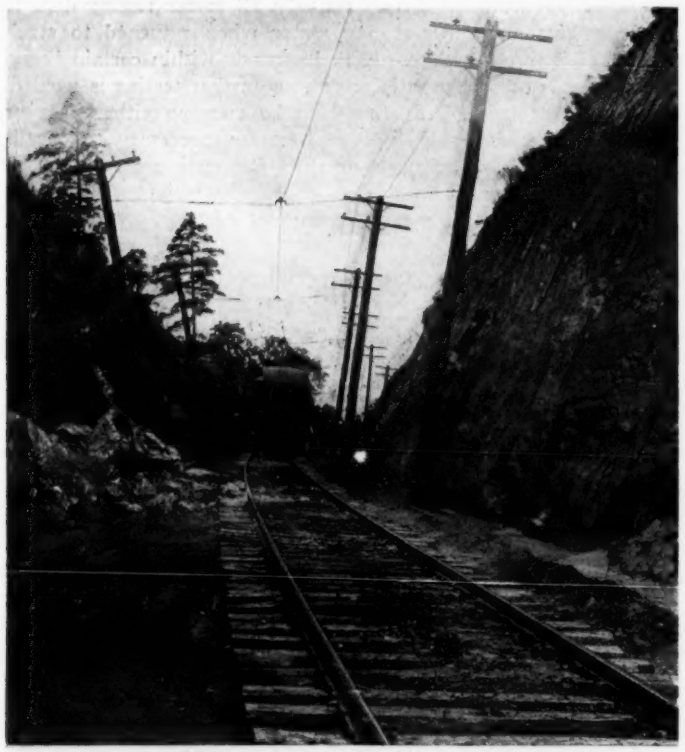


FIG. 1.—VIEW OF RAILWAY, SHOWING LINE CONSTRUCTION.

The power for the railway is obtained from the hydraulic station of the Atlanta Water & Electric Power, about 18 miles from Atlanta, and is transmitted at a potential of 22,000 volts. The equipment at the hydraulic station includes Westinghouse three-phase, 25-cycle alternators with an aggregate capacity of 10,500 kw. In case of accident to the hydraulic station, current may be obtained from a thoroughly equipped steam-power plant which the Georgia Railway & Electric Company, which also obtains power from the water power station ordinarily, have in reserve for the operation of its lines in the city of Atlanta in emergencies.

The trolley line construction is similar in general to that ordinarily used in direct-current practice, except that specially heavy insulators suitable for the higher voltage are employed. Within the city limits of Atlanta, the trolley voltage is 550, while over all other portions of the railway the trolley voltage is 2,200. A single 4-0 trolley wire forms the entire 2,200-volt distributing system. The trolley wire is suspended from cross spans secured to wooden poles set 90 ft. apart on straight track, and about 45 ft. apart on curves.

The high-voltage trolley line is divided into three sections, each fed from one leg of the three-phase transmission system through oil insulated self-cooling transformers. There are two transformer stations in each section connected to the same phase, making a total of six stations located approximately 3½ miles apart. The transformer

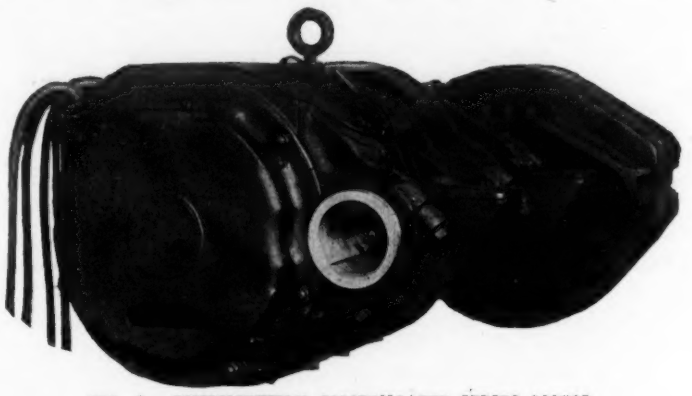


FIG. 2.—CONDUCTIVELY COMPENSATED SERIES MOTOR.

stations are well constructed of brick, and each is equipped with one 150-kw Westinghouse oil-insulated self-cooling transformer, together with the necessary lightning arresters, choke coils, switches and fuses. The transformer in Atlanta and one in a car barn near the limit of this city supply the 550-volt section of the trolley, and in order that all transformers may be interchangeable, each is wound so that the secondary voltage of either 2,200 or 550 may be used. Since these stations contain no moving machinery, no attendants are required. An occasional inspection of the stations is all that is necessary.

Each transformer is mounted on a low truck, and is installed in the transformer station on a platform at the height of a standard flat car. A reserve transformer is held in the car barn mounted on a similar truck and loaded upon a flat car ready for instant transportation to any part of the line. This outfit serves as a reserve unit for all of the stations. In case of a breakdown or other trouble at any station, the crew of the first car discovering the difficulty would notify the car barn force, who would then have the flat car hauled to this point and on arriving would roll the damaged transformer and its platform on to the flat car and replace it by the reserve unit. As each transformer station is capable of carrying the entire load of its section, practically a duplicate installation has been made. With this arrangement and the reserve unit described above, there is little likelihood of cessation of service because of failure of the power supply.

The rolling stock comprises six passenger and one freight car, four cars being employed in regular service to maintain a half-hour schedule between terminal points. The running time is 45 minutes each way, including some twenty stops. During the heavy rush hours, 180 passengers have been carried on a single car.

The passenger cars measure 50 ft. 6 in. over all, and weigh about 30 tons each. They have a seating capacity of 56 persons. All cars are of the double-truck type, with 38 ft. between truck centers.

The passenger cars are equipped with quadruple Westinghouse 50-hp motors. The equipment of these cars is remarkable for its simplicity. The circuit from the trolley passes to an auto-transformer through a double-throw oil switch, which connects it to either one of two taps on the high-tension winding of the transformer according to whether 2,200 or 550 volts is used on the trolley. After leaving the auto-transformer, the circuit passes directly to the ground. The motors may be connected to various taps on the low tension winding of this transformer, giving five different running points.

The connections are made by a drum-type controller, one controller being mounted on each platform. Each controller consists of three drums, one for reversing the relative connections of the field and armature coils of each motor, and the other two, which are directly geared together and operated simultaneously, for varying the voltage impressed upon the motors. The motors are of the

conductively compensated type, and are connected permanently two in parallel, the voltage impressed upon each pair of motors being regulated by one of the controller drums mentioned above.

The feature of particular interest in connection with the operation of the controller resides in the means employed for preventing sparking in the controller when the connections are changed from one tap to another on the auto-transformer. There are on this transformer six intermediate taps corresponding to voltages 144, 174, 204, 234, 266 and 288, respectively. There are, however, only five running points corresponding to voltages 159, 189, 219, 240 and 277, respectively. It will be noted that these voltages are in each case midway between the ones of the transformer taps. The running voltages are obtained from the neutral point of a so-called "preventive coil"—an inductive coil—which is connected across adjacent taps of the auto-transformer. The segments on the controller drums are so arranged that, in changing the preventive coil from one pair of transformer taps to the next adjacent pair, the circuit is never opened simultaneously at both ends of the coil. In parallel with the preventive coil is connected a "preventive resistance" through one-half of which flows the major portion of the current to the motor when the controller is being moved from one running position to another. The preventive resistance is so designed that it takes but little current when subjected to the small voltage between adjacent transformer taps (30 volts) and yet absorbs but little voltage when carrying the full current of the motor. It is evident, therefore, that the motor circuits are never completely opened during operation, and yet there is no direct short-circuit produced between adjacent transformer taps. On the highest running notch of the controller the preventive resistance is cut completely out of circuit, so as to eliminate entirely the loss occasioned by the current due to the voltage between adjacent transformer taps.

The freight car is equipped with four motors similar to those used on the four passenger cars with hand control, but in order that this car may be operated on any part of the city system as well as over the company's own tracks, the equipment is arranged for operation on either direct or alternating current. It can be run from a standard 550-volt, direct-current trolley, the 550-volt, alternating-current trolley in Atlanta, and the 2,200-volt, alternating-current trolley between Atlanta and Marietta. To meet these widely different conditions, a combination of rheostatic and voltage conrol is used instead of pure voltage control as on the passenger cars. The motors are connected permanently, two in series, and the two groups thus formed may be connected to any one of three different taps on the transformer. In starting the car, the motors are connected first to the lowest tap, then to the middle tap through a resistance, next to the middle tap without the resistance, then to the highest tap with the resistance in circuit, and finally to the highest tap with the resistance short-circuited. With this equipment, three different running points are obtained.

When operating on direct-current, the motors are connected all four in series and rheostatic control only is used. There are thus four resistance points in addition to the "full-on" position.

Current is collected from the trolley wire by means of wheels operated by series-wound motors similar in general to the main car motors.

Great credit is due to the management of this company, which consists of P. S. Arkwright, president; T. K. Glenn, vice-president; G. W. Brine, secretary and treasurer, and A. Balsley, chief engineer, for the successful entrance of alternating-current into the southern railway field, and for their pioneer work in this important development of electric transportation. The work of installation and construction has been done almost entirely by the company itself, including the track and overhead construction which was conducted under the management of William Glenn, engineer of maintenance of way.

FIG. 3.—CONTROLLER, SHOWING GEARED DRUMS.

Magnetic Switch Controllers for Automatic Ore Unloaders.

On page 239 of our issue for August 5, 1905, an illustrated description appeared of two electrically operated Hulett automatic ore unloaders at the docks of the National Tube Company, Lorain, Ohio. We are enabled to present below a detailed account of the magnet switch controllers on these unloaders, upon which the success of the equipment largely depends.

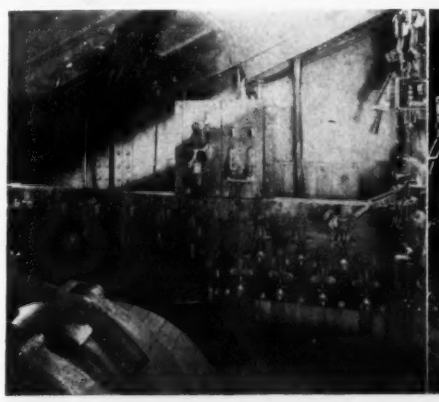


FIG. 1.—CONTROLLER FOR OPERATING GRAB BUCKET.

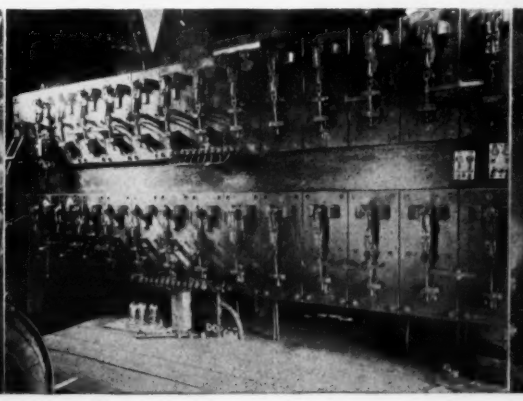


FIG. 2.—CONTROLLERS FOR HOIST AND TROLLEY TRAVEL.

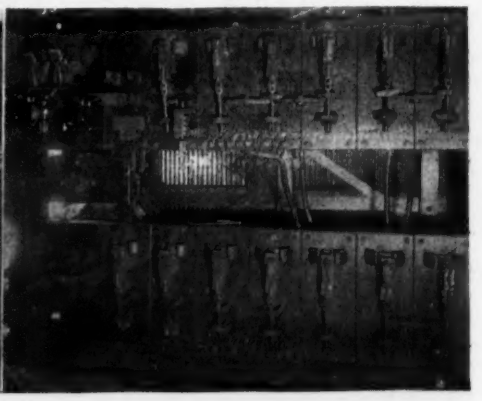


FIG. 3.—CONTROLLER FOR BUCKET CAR MOTORS.

of the ordinary type except that the poles are mounted on porcelain insulators on account of the high voltage which is used. Each car carries two trolley poles, one at each end, and is equipped with Westinghouse straight air brakes, the compressors for which are

The controllers proper consist of a number of magnetically operated clapper switches which cut resistance in and out of the motor circuits. The switches are operated by solenoids placed on the back of the switch-panel. The main contact of each switch is

a heavy laminated copper brush reinforced with a yellow brass contact, the final break being taken between carbon contacts, and the arc is quickly ruptured by a powerful magnetic blowout. The switches are controlled by small master switches located in the operators' cabs. As the solenoids of the switches require but few amperes, the wires connecting the master switch with the controller proper are of very small size.

Each motion of the unloaders is provided with a positively connected or geared automatic output or emergency switch. The cut-outs on the hoist and bucket-car motions automatically slow down and stop these motions as the limits of travel are reached. They first gradually introduce resistance and slow down the motor; then change connections to convert the motor into a generator, and apply a gradual dynamic breaking effect until the motion is nearly stopped, and finally apply band brakes.

The application of dynamic braking to the above-mentioned motions is of particular advantage, as the energy of these heavy parts is absorbed and dissipated in the resistance, thus removing practically all wear from the solenoid band brakes. Under these conditions, the band brakes operate as holding brakes and are required to stop the motion only upon failure of the current. The bucket rotation and trolley motions are supplied with automatic slow-down and cut-out devices which gradually insert the resistance and finally apply solenoid band brakes to stop the motion as the limits of travel are approached.

While all of these automatic devices fully protect the machinery and motors against failure of current, confusion and faults of the operator, still they allow the operator full control of the motors

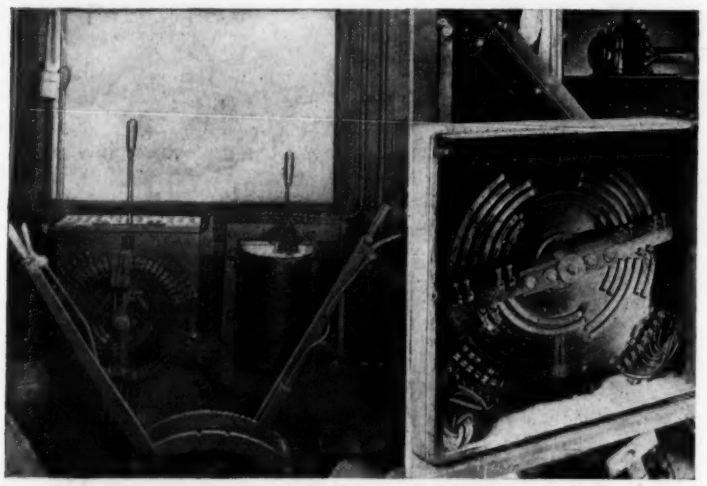


FIG. 4.—INTERIOR VIEW OF THE BUCKET-CAR OPERATOR'S CABIN, SHOWING THE MASTER CONTROLLER.

FIG. 5.—AUTOMATIC SHUT-DOWN AND CUT-OUT SWITCH FOR BUCKET CAR MOTOR.

at all times, with the exception that he is unable to pass a predetermined limit of travel of the motions.

The main controllers are located as near to their respective motors as possible, so that the heavy wires carrying large currents are made as short as possible. The master switches or controllers are small, thus allowing such an arrangement that all operating handles are brought within easy reach of the operator. They are very easily handled and do not fatigue the operator, thus allowing full output of the machines at all times irrespective of the physical condition of the operator.

The magnetic controllers, which regulate the movement of the bucket in and out of the boat and the raising and lowering of this bucket, are shown in Fig. 2. To the left there are seen four pairs of two switches each interconnected by means of horizontal levers. These are the reversing switches, and the function of the levers is to prevent the closing of both reversing switches at the same time. To the right are seen three switches interconnected by means of two levers. The function of these levers is to prevent the closure of the middle or dynamic breaking switch when the motor is still connected to the line and operating as a motor. The levers are also used to hold open the switches at either side of the center switch when the motor is acting as a generator with the center switch closed. Fig. 1 shows the magnetic switch controller for the operation of the clam-shell bucket. The smaller switches at the left are the accelerating or resistance switches. These switches are so interconnected that the succeeding one depends for its closure upon the closure of the one preceding. One terminal of the operating solenoid of each switch is connected to such a point on the resistance that the current taken by the motor upon the closing of the preceding switch must fall to a certain predetermined value before the following switch can close. This means that the motor must come up to a speed corresponding to each accelerating switch before the following switch will close. This results in the smoothest possible acceleration in the shortest possible time consistent with safety to the motor and the driving mechanism, and makes the acceleration of the motor entirely independent of the operator, should he throw the master switch with extreme rapidity.

The result of this design is to cause the motor to approximate almost exactly the operation of a hydraulic or steam cylinder; that is, it will keep a predetermined pressure on the bucket jaws and will not exceed this pressure. The motor is generally stalled once during every closure of the bucket, and this occurs without injury to the motor, controller or attached mechanism.

Fig. 3 shows the magnetic switch controller operating the bucket-car haulage motor. The ore is dumped from the bucket into a car which is pulled up the incline by a motor located in the machinery house underneath the trolley. The car is automatically dumped near the end of its travel by means of mechanical dogs.

Figs. 4 and 5, respectively, show the master controller and the automatic slow-down and cut-out switch which control the motion of the car. The manually operated controller to the left of the master controller is used for the purpose of slewing the entire machine so that it may be brought parallel to the hatches of the boat. This dock being built on a large curve makes this motion necessary to secure the best operation. The main controller house is located on the trolley underneath the walking beam and is divided into two parts, one part containing the machinery and controllers and the other, the resistances.

This type of control was designed, developed and built by the Electric Controller & Supply Co., of Cleveland, O., which also made the magnetic cushion-type solenoids for the band brakes, and all other electrical details.

Electrically-Operated Bulkhead Doors.

On each of the new warships of the navy there is installed what is known as the "long-arm" system of electrically-operated bulkhead doors and hatches controlled from a central point. Each door and hatch plate is provided with a motor by which it is closed when emergency requires. The power for the motors is controlled from a special emergency station which is contained in a two-part water-tight case secured to the side wall of the pilot house or other convenient place above decks. The general features of the system have already been described in these columns.

The apparatus of the station consists of three parts: First, the mechanism for controlling the circuits running to each door or hatch gear; second, the lamps which indicate the closure of each door or hatch, and, third, the fuse box in which each entering wire is supplied with its proper fuse. Fig. 1 shows the circuits of the emergency station, while Fig. 2 shows the station complete with the protecting covers.

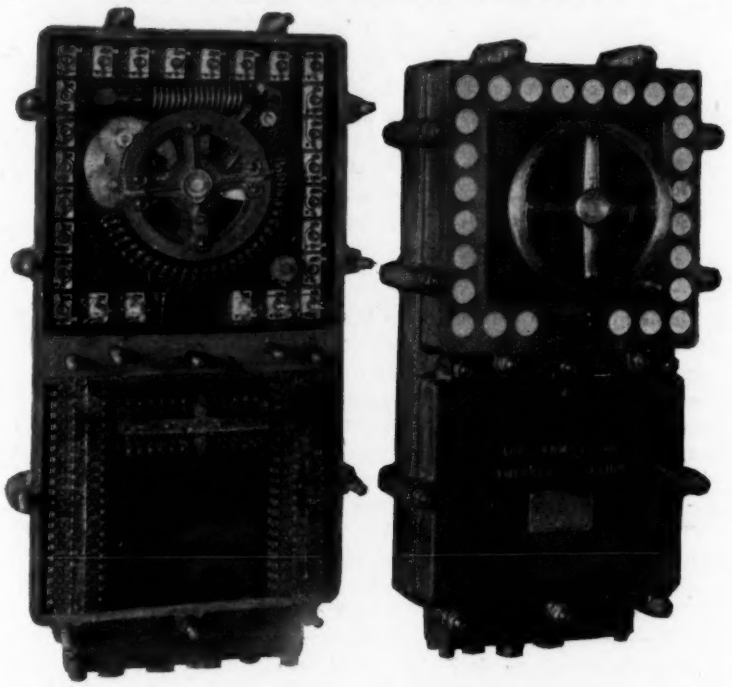
To operate the emergency station the officer in charge releases a hand wheel, which, in turn, releases a gear driven by a powerful spring and controlled by a suitable escapement. This gearing closes the circuits for operating the emergency switches located in the controller of each door and hatch gear. In performing this function the gearing does not start all the motors at the same instant, for the reason that this would demand a large supply of current from the generators. It starts them one after the other at about a three-second interval, so that there are seldom more than four motors in operation at any one time, although the entire closure of twenty-four doors and hatch gears controlled from one emergency station may be accomplished normally in about a minute and a quarter. When, however, an extremely quick closing of all doors is required, the time can be reduced to thirty seconds by simply using the hand on the wheel of the emergency station to hurry it; and this action does not alter the closing speed of any individual door or hatch.

As each bulkhead door reaches its water-tight seat, it automatically closes a circuit which runs to the emergency station where it is connected with one of the small incandescent lamps. Transparent discs over these lamps bear numbers corresponding to the numbers of the

various doors under control. The officer in charge, by pressing a button, can cause the indicator lamp of every closed door and hatch to glow, thereby assuring himself of the successful operation of the emergency action. If any door is prevented from closing by obstructions left in its path, this fact at once is apparent to the officer in charge, and no time need be lost in reaching the scene of the difficulty.

The emergency station contains but one spring which furnishes the entire power for operating the device. This spring is of the helical type and of ample strength for the work it is called upon to do.

Although the experience of hard sea service has shown that the emergency station can be depended upon for successful operation at all times, to guard against the possibility of failure the mechanism



FIGS. 1 AND 2.—VIEWS OF INTERIOR AND EXTERIOR OF EMERGENCY STATION.

can be actuated at any time by turning the hand wheel located in front of the case should the station fail to act automatically by the power of the spring when released. During any emergency period a red indicator lamp glows continuously, so that a casual glance at the emergency station shows at once whether the emergency is "on" or "off." After a danger period is passed and it is desired again to establish normal conditions below, the emergency may be thrown off by a hand reversal of the same operating device which is used to throw it on, so that the mechanism when not in use is always set ready to operate and always available in time of need. These equipments are supplied by the "Long-Arm" System Company, of Cleveland, Ohio.

Improvements of Savannah, Ga., Central Station.

Mr. L. R. Nash, manager of the Savannah (Ga.) Electric Company, informs us that extensive improvements of its plant are being made. In the lighting station is being installed a 500-kw, two-phase, 60-cycle, 2,200-volt turbine of the Westinghouse Parsons type. In connection with this turbine is being installed also a surface condenser with wet and dry vacuum pumps, all furnished by the Worthington Company and capable of maintaining a vacuum of 28 in. even under the unfavorable conditions of circulating water temperature which exist at Savannah in the summer season. This turbine will be operated at the present time with steam pressure of 130 pounds without superheat.

An addition will also be made to the direct-current, three-wire system which supplies the business district of the city, consisting of a so-called "three-wire" generator, which not only delivers current to the outside wires of the system, but has a connection also, through balancing coils, to the neutral. New switchboard equipment will also be installed, for generators, feeders, exciters, etc.

In addition to the above improvements in the station itself the company has just purchased a valuable piece of wharf property which lies between its station and the Savannah River, from which condensing water is taken, and from which the regular coal supply is delivered. It is the company's intention to design a pocket on this wharf for coal storage, with a conveying belt between it and the boiler room. This work, however, will not be undertaken at the present time. The total cost of the above improvements is somewhat in excess of $100,000, the work being in charge of the general managers of the company, Messrs. Stone & Webster, of Boston.

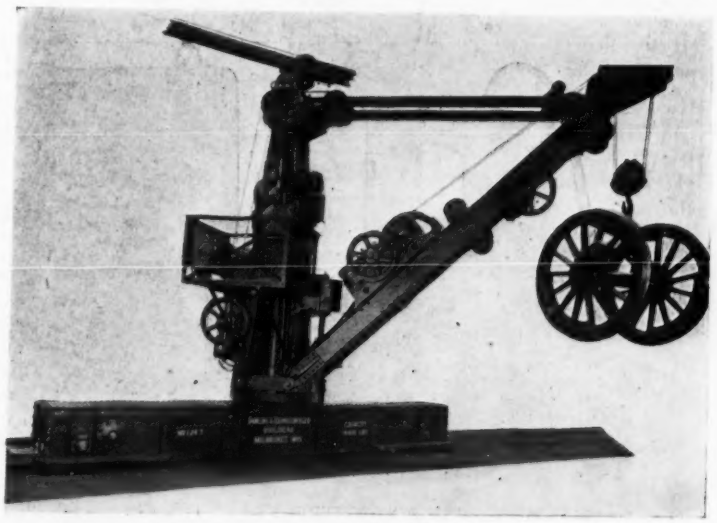
Electric Walking Jib Crane.

The accompanying illustration shows the newly designed type of "walking jib crane," recently erected by Pawling & Harnischfeger, Milwaukee, Wis., for the Chicago Northwestern Railway Co., for its locomotive repair shop at the West Chicago works.

The truck girder, or housing, contains and supports the two main truck wheels which are the drivers of the crane traveling motion. To the side of the girder is fastened the propelling motor, shafting and gearing, directly connected to the two driving trucks. The column socket is also contained in and is part of the girder. Fastened to this socket is the main gear to which is connected the motor for slewing.

The center post is machined from a solid-steel forging about the bottom of which is the heavy cast-iron roller frame supporting the channel frame and main boom. This roller frame also carries the slewing pinion shaft and two thrust rollers. To the upper end of the center post is fastened the pintle with steel idler wheels, between which the guiding rail is placed. On the center post and immediately below the pintle is the steel crosshead which is equipped with plate hangers for fastening the upper ends of the channel frame and which also receives the shafts, sheaves and equalizer yoke of the boom adjusting mechanism. The weight of all the revolving parts and of the load carried by the crane is suspended from the crosshead.

The distinguishing feature of this design is the adjustment of the main boom for different heights, and the auxiliary or extension boom, that can be extended for a hook radius of 23 ft. by a screw arrangement worked by hand power through a pendant



WALKING JIB CRANE.

chain, and can be operated from the floor. This hand chain is not shown in the illustration. All the other movements are driven by electric power, each having an individual motor. Attached to the side of the channel frame is the operator's cage which swings with the crane at such a height that the operator can always see the hook or load and can observe any obstructions that would be in the way of the swinging boom.

With the exception of the traveling motion, the mechanism throughout is provided with spur gearing. Safety devices to avoid breakage due to carelessness of operator are provided where needed.

Electric current is supplied to the crane from collectors fastened to the top pintle. To the center post is fastened the collector rings for the main line to the switchboard in the operator's cage and for the distributing lines to the travel motor.

The crane has a capacity of 7 tons at 16 ft. radius of boom and about 20 ft. lift, and its approximate weight is 41,000 pounds. The construction is such that all parts are readily accessible for inspection and maintenance.

Newer Methods of Street Lighting.

President M. T. Morrill, of the Golden (Col.) Illuminating Company, sends us the subjoined interesting data as to the adoption of the Nernst lamp there for street illumination:

Our old plant was the 3-wire Edison system and we had in use on the streets eight enclosed multiple direct-current arc lamps for which we received $8 per month each. In March of the present year we changed to alternating-current system and installed alternating-current arc lamps in place of the direct-current lamps. The service was very unsatisfactory and by permission of the city council we substituted 4-glower Nernst lamps for the alternating-current arcs at the same rental. We furnish the lamps and the maintenance as with the arcs.

The Nernst lamps are mounted on the same brackets as were used for the arcs and are placed at each street intersection. The service has been very satisfactory and the cost of maintenance but little more than for arcs. There is a saving to us in current and attention that more than makes up this difference. In addition to the Nernst lamps, we have 75 incandescent lamps of 25-cp, and we expect to substitute single glower Nernst lamps for some of these on some of the more important corners.

A New Desk Telephone.

Within the past year, the Kellogg Switchboard and Supply Company, of Chicago, Ill., has placed on the market a desk telephone having several novel features, and in which all unnecessary complications are done away with. The stand shown in Fig. 1 gives a good idea of the general appearance of the telephone.

FIG. 1.—GENERAL VIEW OF DESK TELEPHONE.

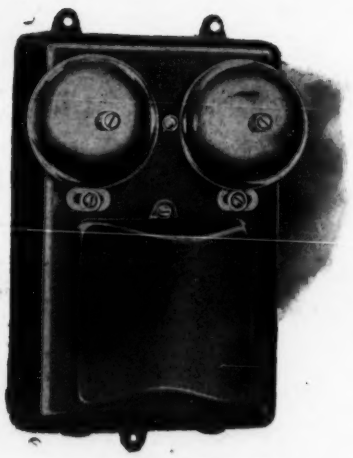


FIG. 2.—EXTENSION BELL.

The transmitter is connected by an adjustable hinge at the top of the tubular standard, and this hinge is so constructed that the two cords connecting the transmitter with the apparatus in the base pass through the inside of the hinge, being insulated entirely from the metal frame of the stand. The weight of the stand is concentrated in the base, making it hard to upset, thus lessening the liability of breaking the receiver shell or transmitter mouthpiece.

The hook-switch instead of being located in the tubular standard or on the outside, is mounted in the base where it is easy to get at when necessary. It consists simply of two stiff German-silver springs with platinum contacts, the springs being actuated by a new kind of lever called the "toggle-joint lever," which makes possible a large motion of the switch springs, insuring good wiping contacts with a small motion of the receiver-hook.

This system has made it possible to locate everything in connection with the talking and signaling circuit in the base of the desk stand, the ringer being mounted in a separate box made of three pieces of drawn steel enameled in black. This extension bell, illustrated in Fig. 2, is a novel departure in extension bell design. The sides and front of this box, instead of being made of five pieces of wood, are in this box all made of one piece of steel drawn into the required shape by powerful punch presses.

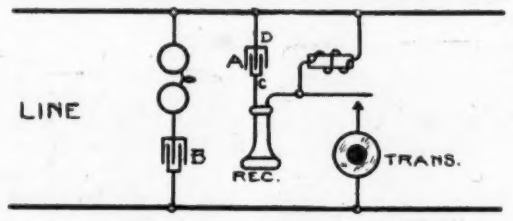


FIG. 4.—DIAGRAM OF TELEPHONE CIRCUITS.

A condenser having a capacity of 2 microfarads is placed behind the ringer.

The apparatus mounted in the base of the stand is clearly shown in Fig. 3, where the felt-covered base-plate is removed. The small condenser shown at the top of the cut was especially designed for this desk stand, and has a relatively large capacity. The small impedance coil shown on the right is also of special design, and very effectually accomplishes its purpose. The connecting rack is simple and practical in construction, two connectors being used for the receiver and two for the extension bell.

The circuits are shown in Fig. 4. Current is furnished from the main exchange, and on entering the telephone finds a ready path through the impedance coil and transmitter when the hook-switch is closed. The receiver and condenser are bridged around the impedance coil, and the high-frequency voice currents on entering the telephone find a free and non-inductive path to the receiver, as the condenser, *A*, is perfectly transparent to the high frequency incoming voice currents, while the coil is designed so as to offer the greatest possible impedance to the voice currents. At the same time this impedance coil allows the free passage of the direct-current battery supply. Furthermore, the introduction of condenser, *A*, into the talking circuit has a marked effect on the talking quality of the system. During conversation the condenser becomes charged by the action of the battery current from the exchange, and as the transmitter is spoken into the difference of potential is varied at points, *C* and *D*. This variation causes condenser *A* to charge and discharge, and has the effect of producing a secondary voice current which is superimposed on the alternating currents set up by the action of the transmitter alone. These two effects taken together produce a smoothness and intensity in transmission, that makes distinct speech possible over very long lines. The fact that condenser, *B*, and the ringer are permanently bridged across the line, makes the two-conductor cord and simple hook-switch possible.

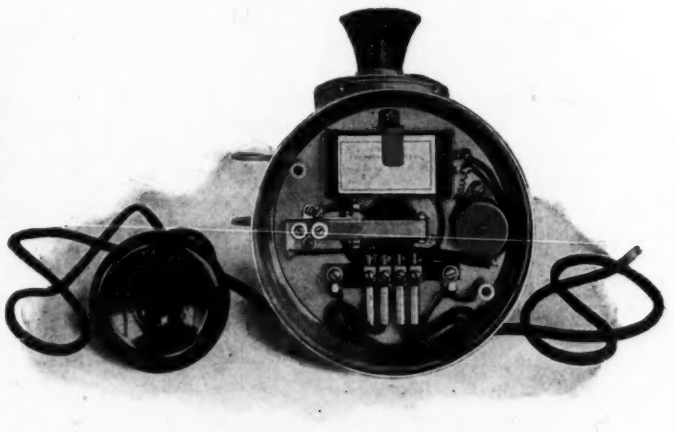


FIG. 3.—VIEW OF STAND WITH BASE PLATE REMOVED.

New Wireless Telegraph Station at South Boston.

The American DeForest Wireless Telegraph Co. has recently placed in commission a new high powered station at South Boston, Mass., which has already proved to be of notable commercial value in the transmission of messages between coastwise steamships and the shore. The station is one of the company's chain extending between Havana and Portland, Me., and it is capable of transmitting and receiving in connection with both land and marine service. It is located near the edge of Boston Harbor on M Street, between 8th and 9th Streets, and is connected by telephone with the company's commercial office at 152 Devonshire Street, in the downtown district.

The transmitting and receiving instruments are installed in a small one-story frame building, the interior being divided into five rooms. Power is taken from the alternating-current mains of the Edison Electric Illuminating Company, a 30-kw transformer being located on a pole at the company's yard boundary to reduce the potential to 104 volts for service in the station. From the transformer the current is carried to the building in about 25 ft. of underground cabling, to avoid an aerial crossing beneath the high-tension circuit which leads to the mast that carries the antennae. From the cables the power is carried into the transformer room of the station—a 10 ft. by 12 ft. compartment lined with sheet iron—and after passing through the usual equipment of main switch, recording wattmeter, and Wright demand indicators the circuit is brought to a 20-kw reactance coil which controls the main transformer, the latter raising the potential from 104 to 25,000 volts. The main transformer is of the oil insulated type and it is mounted upon porcelain insulators resting upon a wooden base that is set upon the concrete floor of the room close by the reactance coil. The transformer is rated at 25-kw; is supplied at a frequency of 60 cycles and was built by the American Transformer Co., of Newark, N. J. In the transformer room is also a motor-generator set which supplies direct-current to part of the DeForest equipment. This set consists of a 2-hp, 104-volt, 60-cycle Holtzer-Cabot motor direct coupled to a 9-kw, 110-volt generator. On a shelf above the motor-generator set are six special Leyden jars arranged to protect the machines from high-tension discharges. Two of the jars are connected to the motor leads, one being topped into each wire, the other four jars being similarly connected to the generator leads. The outer coatings of all the jars are grounded, as the jars are set upon a copper strip on the shelf, which is connected to earth. Two General Electric magnetic blow-out lightning arresters are also connected to the motor leads.

Adjoining the transformer room is the condenser room. This is about the same size, and the 25,000-volt circuit is brought to it through two glass plates set into the partition wall. There are two large condensers mounted here, each being made up of glass plate coated with tinfoil, the assembler united being immersed in a non-metallic tank, in which is a heavy oil bath. Each tank is 5-ft. long and 30-in. wide. The spark-gap case stands next to the condensers, and on top of this is a helix made of hollow copper wire, used in adjusting the wave-lengths of the wireless signals sent out from the station. The spark-gap case, or "muffler," is designed for operation with sparks as long as 1½ in. if desired; its interior is lined with asbestos to prevent the occurrence of fire, and peep holes covered with glass are provided to enable the operation of the spark to be observed at will. In a station of this capacity the noise made by such a powerful spark discharge within the confines of a small room is almost deafening, and the importance of shielding the ears of the operators require careful construction at the muffler. In the South Boston station the muffler is supplied with a powerful air blast which is turned directly upon the spark discharge. The air supply is brought into the spark chamber by a porcelain insulated pipe leading to a blower driven by a direct-connected Roth motor rated at 1/6-hp, 110 volts, direct-current. This motor is also protected from high-tension discharges by a half-dozen Leyden jars connected to its leads, and grounded on the outer coatings. The motor wiring is carried along the wall of the condenser room, and it is protected from the high-voltage by a coating of grounded tinfoil throughout its entire run.

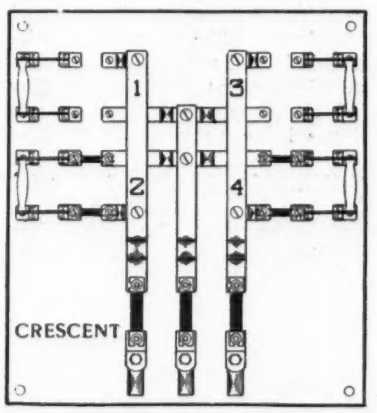
The operating room adjoins the condenser room and in one corner is set up a slate switchboard which controls all the apparatus in the station. The table at which the operator works is equipped with a sending key, double-pole switch for sending or receiving connections, a syntonizer or tuning apparatus for adjusting the wave-length, and the DeForest electrolytic receiver. The latter operates two head telephone receivers through a local battery circuit. With the DeForest receiver forty-five words a minute have been handled, and atmospheric disturbances are said to be far less troublesome than with the coherer systems. Something beyond an ordinary thunderstorm is required to shut down the South Boston station.

From the condenser room the 25,000-volt circuit passes upwards through the ceiling to a pair of porcelain bushings extending through the tarred roof. Changes in direction are made by the aid of tarred hemp guys. The wires then pass through the bushings to two high-tension insulators mounted on the roof, whence they are carried to the 15 antenna steel wires arranged in east and south fans supported by the mast. The mast is 208 ft. high, set in a concrete foundation and guyed by 16 cables, in each of which is at least one strain insulator. The mast was built in sections of four upright pieces each, and the uprights and spacing pieces are strongly bolted together into a single substantial pole section at each point of junction. A horizontal spar, used in spacing the antenna wires, is attached to the top of the pole. It is 50 ft. long over-all. The receiving circuit is composed of steel antenna wires which are all brought together at an insulating bushing in the roof over the operating room, whence they pass to the instruments upon the table. Three men constitute the operating force, and the shifts are 8 hours in length each.

The South Boston station has often communicated with Portland, Me., and it is expected at an early date that regular commercial service will be inaugurated between Boston and New York. Messages are constantly being received from the captains of steamers passing along the New England coast, and from passengers traveling upon these boats. An interesting example of the value of the services given by the company was furnished by the United States steamship Mayflower, when it was conveying the Russian peace envoys from Oyster Bay to Portsmouth. The Government wireless operator on board this vessel was, at one time, unable to establish communication with any of the Government's own stations, and he accordingly requested the DeForest station at New Haven to handle an important despatch for one of the plenipotentiaries. The message was taken with quickness and accuracy. The manager of the Boston office is Mr. F. C. Marrom, and the South Boston station is in charge of Mr. F. S. Dart.

Three-Wire Panel Board.

The cut herewith shows a simple form of panelboard for three-wire circuits. It will be noted that fuses are provided in both the main and the branch circuits, a double-pole switch being placed



THREE-WIRE PANELBOARD.

in each branch circuit. The cabinet for the panel board may be constructed of either iron or wood, and may be of either the flush or surface type.

The panel board illustrated is designed and built by the Crescent Electrical Manufacturing Company, Rochester, N. Y., which constructs panel boards of all types and makes knife switches, switchboards, cut-outs and branch blocks.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.—Excellent reports are made from all sections, and all the conditions favorable to activity in trade are in prominent evidence. Wholesale distributive trade at the Southwest has received renewed impetus from buyers' excursions, in the Northwest by state fairs, and throughout a wide area by the assurance that the corn crop is beyond danger of frost damage. Cooler weather and the ending of the vacation season has brought about more activity in retail lines North, West and East, while the prompt marketing at good prices of the first pick of the cotton crop has improved both wholesale and retail business at many Southern points. In industrial lines the feature has been unprecedented activity in rail buying by leading companies, the placing of further orders for rolling stock, a number of small purchases aggregating a considerable volume of pig-iron sales, and a stiffening in prices of coke and bituminous coal. Anthracite coal has felt the stimulus of cooler weather. Manufacturers of steel express the opinion that the railroads of the country will spend more money for new equipment over the next twelve months than ever before in history. When the mills opened their rail books for 1906, a few weeks ago, they had no idea of the deluge of business that would come in for next year's delivery. The railroads appear to be anxious to place their orders earlier than usual this year, realizing that 1906 is likely to be a banner year from the standpoint of output, and that they are liable to experience some difficulty in obtaining prompt delivery. The structural mills are turning away business, while some of the Western mills are taking no large orders for delivery this year, owing to the already congested condition of their mills. One of the most favorable features of the situation is the improvement in the light finished lines. Marked activity is noted in hardware and lumber at leading Western markets, and collections are reported good. Bank exchanges at New York were 44.7 per cent larger than in the same week of 1904, while at other leading cities the gain averaged 14.6 per cent. Evidences that past and present heavy purchases of commodities, coupled with the usual movement of crops to market, will severely tax the railway interests of the country, are already visible. Gross earnings for the month of August promise to show an increase over August a year ago of fully 7 per cent. Present prices for grain do not, however, seem to tempt farmers, and the wheat movement is not as large as expected. The long-awaited resumption of export trade in cereals is evidently close at hand. Good demand from foreign sources was a steadying influence in wheat, corn and oats, and, in conjunction with less satisfactory crop reports (rains in the Northwest), helped to advance prices slightly. There was a marked decrease in the number of business failures during the week ended September 7, as compared with those of the week previous, according to *Bradstreet's* compilation. The total for the week was 137, and during the previous week it was 161. In the corresponding week last year the number was 144. The copper market was quiet and featureless, with a weaker tendency. The closing quotations were 15¾a16¼c for lake and electrolytic and 15½a16c for casting copper. The brass manufacturers of Connecticut, the General Electric Company and the Westinghouse Company are doing the largest business in their history, and all are being accommodated with hand-to-mouth deliveries of copper.

HOUSING GENERAL ELECTRIC EMPLOYEES.—The General Electric Company has formulated a plan for housing its employees at Lynn. It embraces the proposition to purchase land, erect cottages of six rooms and offer them upon terms that will be as easily met as the rent now paid. The offer is open to every one of the 7,000 employees and a committee of 10 of the latter is engaged in making subscribers. A great many have at once accepted. The company limits the cost of the land to $400 and the cottage $1,800, and will build nothing but cottages. The terms are that each subscriber shall have $4 taken out of his wages every week, which includes the interest on the total cost, taxes, insurance and water rates. The company figures that this instalment will clear the house of all indebtedness at the end of eight years, when the cottage becomes the property of the occupant. In addition the company agrees to give a life insurance policy to each subscriber for a fixed amount, and if the subscriber should die before the house is paid for, so much of it as is required to pay for the house will be deducted for that purpose, and the house will become the property of the widow or other beneficiaries, the balance of the life insurance also to be paid to them. The company has set aside the sum of $300,000 to carry out this project and M. W. Alexander has been chosen to supervise the execution of the plan.

BRITISH INDIA LIGHTING PLANT.—The Department of Commerce and Labor reports that an electric light plant is to be erected in Mussoorie, British India. Offers are invited for the following materials: Steel pipes, water turbines, alternating dynamos, switchboards and instruments, transformers, induction motors, pumps, tools and implements for the workshops. The foregoing are to be supplied and erected by the contracting party, but the following simply supplied: Plain copper conducting wires, isolators, arc and incandescent lamps, telephone plants, tools, sundry materials. The conditions may be obtained from the city engineer, C. H. Chanan, Municipal Office, Mussoorie, upon deposit of 75 rupees (about $25), which sum will be returned upon presentation of bona fide offers. Sealed offers in the prescribed form, bearing the heading "Tender for electric lighting and water works scheme," are to be in the hands of the "Chairman, Municipal Board, Mussoorie, U. P., India," by October 23, 1905.

NEW TELEPHONE METER.—A new telephone meter that was patented some time ago by Frank Powell and E. R. Ellis, of Chicago, has been bought outright by Toledo capital and will be manufactured in that city. The United States Coin Register Company, an Ohio corporation of Toledo, with a capital of $50,000, has been launched with the following officers: President and treasurer, W. G. Nagal; vice-president, W. B. Tyler; secretary and manager, G. S. Powell. The latter is a brother of the inventor. Besides those named a number of prominent local telephone men are stockholders of the company. The concern is organized to manufacture a device for registering cash put into telephone pay stations and for recording measured service. The invention is the product of several years' labor on the part of the men who perfected it. Mr. Nagle is president of the W. G. Nagle Electric Company of Toledo.

NEW YORK ELECTRICAL SHOW.—Madison Square Garden has been secured for an electrical show, from December 11 to 23 inclusive, and active preparations are already being made. It is said that the transient population of New York in December is 750,000 people, many of whom will be glad to visit such an exhibition, to say nothing of the regular inhabitants. Dr. George F. Sever, of the Department of Electricity of Columbia University, is director of exhibits and he has already secured enough exhibitors to make the show an attractive one. The list of exhibitors will be published in these columns shortly and the additions will be given from time to time. While considerable space has been secured, some of the best positions are open. The office address is 26 Cortlandt St., New York, Telephone 6190 Cortlandt.

SUPPLIES FOR NAVY YARD.—Bids will be received until September 19 at the Bureau of Supplies and Accounts, Navy Department, Washington, to furnish, at the navy yards, etc., at Portsmouth, N. H., Boston, Mass., Newport, R. I., New York, N. Y., League Island, Pa., Washington, D. C., and Norfolk, Va., electric cable, incandescent lamps, motors, electrical supplies, circuit breakers, etc.; also electrical supplies at the navy yard at Pensacola, Fla., and the naval stations at Key West, Fla., and New Orleans. Address H. T. B. Harris, Paymaster General, U. S. N.

THE INTERNATIONAL ELECTRIC & MANUFACTURING COMPANY, of Milwaukee, Wis., with a capital stock of $300,000, proposes to take over the option of the Milwaukee Engineering Company on the plant and business of the Milwaukee Electric Company at West Allis, for the manufacture of electric machinery of all kinds, gas and gasoline engines, steam boilers and engines, switchboards, telephone and telegraph instruments, water and electric meters, street railway motors, alternators and rotaries.

ELECTRIC FANS FOR KITCHEN.—The E. F. Sturtevant Company, of Boston, Mass., has just sold a set of large electric propeller fans for kitchen ventilation in the Government Hospital for Insane at Uniontown, D. C.

NEW BULLOCK ELECTRIC PLANT.—The Bullock manufacturing part of the Allis-Chalmers Company has let the contract for an addition to be built to its shop No. 3, at Norwood, Cincinnati. This new structure will be 105 x 250 feet, two stories high. It will be utilized for the manufacture of auto starters, transformers, controllers and switchboards. An industrial railway has been put across the street connecting the foundry and pattern buildings with the main plant.

POWER DEVELOPMENT IN MEXICO.—The Mexican-American Power Company, which is composed of Philadelphia (Pa.) capitalists, will erect several electric power plants near the city of Mexico and build transmission lines for the purpose of providing power for operating industries there and in a number of towns in the vicinity of the power plants. It is one of the largest electrical projects to be undertaken in Mexico, the amount to be invested being estimated at $10,000,000 gold. It is stated that the first instalment of $1,500,000 in cash has been paid in, and that all preliminary plans are completed for the immediate construction of the power plants. The main plant will be located on the Malinaltenango River, at the foot of the Snow Mountain near Toluca. Other power plants will be erected on the Meyuce and Tizates Rivers. According to the reports of engineers who have investigated the water supply and fall of these rivers, the three plants will be able to generate not less than 90,000 horse power. The initial plant will have a capacity of 10,000 horse power. The falls in these rivers are so great that it will not be necessary to construct dams or long canals. By digging a short canal the water from the Malinaltenango River will be dropped into a barranca, or basin, a distance of 820 feet, and thus afford the necessary power for the electric generating plant. It is stated that aluminum will be used for the transmission lines. The generating plants will be situated at an altitude of about 10,000 feet. In addition to the transmission line to this city, others will be built to Toluca, El Ora and a number of other towns and mining centers in this part of the country. Joel H. De Victor, of Philadelphia, is president of the company. A. S. Harvey, of the same city, is vice-president.

POWER FOR INTERNATIONAL NICKEL.—The International Nickel Company will soon have the power improvements mentioned in its last annual report completed, says the *Wall Street Journal*. It is establishing a power plant at High Falls, on the Spanish River, which is situated about thirty miles from its nickel properties at Copper Cliff, near Sudbury, Ont. The company owns rights to develop over 10,000 hp, and at present a plant is being installed which will develop 3,000 hp. According to the last annual report the cost of this plant, including the original cost of the property and the expenses of the long transmission line, will amount to about $700,000. This plan has been under construction for a considerable time, and it will not be long before it is completed. It is anticipated that when the new power plant is in operation a great saving will be accomplished. The cost of power to the company at Copper Cliff, Ont., is very heavy at present, owing to the fact that the power used is produced from coal, and that commodity in northern Ontario is exceedingly expensive, the cost being from $5 to $6 a ton, even when carried most of the way in the summer time via the Great Lakes. It will not be surprising if the company saves $50 per hp, or even more, per year, on the power used at present, when the new plant is in operation.

SALES OF GREGORY ELECTRIC COMPANY.—The Gregory Electric Company, of South Clinton Street, Chicago, reports business as unusually good. Among recent shipments can be mentioned the following: One 200 kw. General Electric railway generator, Ottumwa Traction & Light Company, Ottumwa, Ia.; one 75-kw., 60-cycle Westinghouse alternator, direct connected to a Gates engine, Newport Electric Company, Newport, Wash.; one Thomson-Houston A-18 alternator, Cheney, Kelley & Reid, Eureka, Cal.; one 100-kw. Edison generator, F. E. Monteverde, Hermosillo, Mexico; one Thomson-Houston M-12 arc machine, Empresa del Alumbrado Electrico del Norte, Guatamala, Guat.; one 300-light Perret dynamo, F. Gutierrez, Guadalupe, Costa Rica; one 150-kw. Stanley alternator, I. W. York & Sons, Portage, Wis.; one 150-kw. National generator, W. B. Conkey Company, Hammond, Ind.; one 100-kw. Edison generator, Laporte Electric Company, Laporte, Ind.; one 120-kw. General Electric alternator, Cosmopolitan Electric Company, Chicago; one 75-kw. General Electric, 3-phase alternator, Galesburg Electric Light & Power Company, Galesburg, Ill.; one 100-kw. Western Electric generator, C. C. Haison, Chicago.

NEW SCHIEREN BELT FACTORY.—A modern belting factory and office building has recently been completed by Charles A. Schieren & Company in New York City. It is elaborately described in the *Iron Age*. The Schieren Building, as it is known, is located in the heart of what is still called the "Swamp" and for many years has been recognized as the center of the leather district. It is a ten-story fireproof building, occupying a site 84 x 124 feet, at the corner of Cliff and Ferry streets. The building is equipped with three large electric freight elevators and one high-speed electric passenger elevator, is provided with a sprinkler system for fire protection and has its own plant for power, light and heating. The basement, first floor, part of the fourth and all of the fifth and sixth floors are occupied by the Schieren Company and the remainder is leased to other tenants. The first floor contains the office and shipping room, and the factory proper takes up the remainder of the space mentioned. The hydraulic presses, pumps and accumulators were furnished by the Watson-Stillman Company. The pump outfit is driven by several Westinghouse motors. Electric drive is also in use elsewhere in the plant.

REINFORCED CONCRETE POWER HOUSE.—The latest addition to the list of reinforced concrete power houses is that being built for the Waltham Gas Light Company, Waltham, Mass., by J. G. White & Co. The entire building is to be of reinforced concrete construction—no exposed steel framework will be used. The design calls for very large windows, thus insuring ample light and ventilation. Steam will be supplied by four 350-hp Sterling boilers, set in batteries of two each, an 8 ft. 6 in. by 180 ft. reinforced concrete stack furnishing natural draft. Suspended coal bunkers occupy the upper half of the boiler room; these are filled by coal conveyors. Chutes from the bunkers operated by valves from the boiler room floor, feed the coal to the boilers. Two 500-kw Parsons turbo-generators direct connected to Westinghouse dynamos form the main engine equipment. The White Company is rushing the work, and when completed the Waltham Gas Light Company will have an electric power station which for fireproof qualities and low operating cost it will be exceedingly difficult to surpass.

DISTRICT MESSENGER SERVICE.—In an application to the New York Board of Estimate and Apportionment for a franchise, the United District Messenger Company charges that the various old messenger companies have formed a combination to increase rates, and adds other severe accusations against the American District Telegraph Company. The parties to this combination, it is represented, are the American District Telegraph Company of New York, the Postal Telegraph-Cable Company's Messenger and District Service, the Brooklyn District Telegraph Company, the Eastern District Messenger Company of Brooklyn, and the American District Telegraph Company of Brooklyn. By reason of this combination, it is set forth, rates are charged in many instances 100 per cent. higher than a year ago. Mr. M. W. Rayens, who was once superintendent of the American District Company, is president of the new system, and claims he is being "held up" as to conduit rights of way and telephone charges.

ECONOMIZERS FOR NEW ORLEANS.—The New Orleans (La.) Railways Company has, through its engineers, Messrs. Sanderson & Porter, of New York City, recently purchased from B. F. Sturtevant Company, of Boston, Mass., six large economizers which will be unique in that they are being built to withstand the highest pressure to which any economizer is known to have been subjected. All pipes are being tested to 600 pounds pressure before they leave the works, and each section is tested to 500 pounds after the pipes are inserted. There is but a single gasket joint running through the machine, this joint being made by two very heavy flanges with a special gasket which has 2¾ inches plane surface through the entire circle.

B. F. STURTEVANT.—Among recent sales of economizers made by the B. F. Sturtevant Company, of Boston, Mass., are the following: Sixteen to the Champion Coated Paper Co., Hamilton, O.; two each to the American Steel & Wire Company, Cleveland, O.; Bourne Mills, Fall River, Mass.; Hampton Co., Easthampton, Mass.; one each to S. D. Warren & Co., Cumberland, Mills, Me.; the Solvay Process Company, Syracuse, N. Y.; Mount Hope Finishing Company, North Dighton, Mass., and the New England Company, Rockville, Conn.

NAVY YARD EQUIPMENT.—Bids will be received until Sept. 26 at the Bureau of Supplies and Accounts, Navy Department, Washington, for delivering and installing three water-tube boilers and machinery for the power house at the Navy Hospital, Washington; also to furnish at the Navy Yards, at Boston, Mass.; Newport, R. I.; New York, N. Y.; Washington, D. C., and Norfolk, Va., incandescent lamps, electrical supplies, voltmeters, ventilating fans, etc. Address C. T. B. Harris, Paymaster-General, U. S. N.

HALL SIGNAL CONTRACTS.—The Hall Signal Company has closed a contract with the Erie Railroad for equipping with automatic block signals its line from Bergen, N. J., to Middletown, N. Y., covering 175 miles of track. This is the first important installation of automatic signals which has been made by the Erie. The company has also closed contracts recently with the Chicago & Alton, the Union Pacific and the Alabama Great Southern railroads.

LARGE TROLLEY CONTRACT.—It is stated from Spokane, Wash., that the Spokane & Inland Railway Company has closed a contract with the Westinghouse Company and the St. Louis Company amounting to $600,000 for equipment.

BIDS.—Bids will be received until Sept. 27 by the State Commission in Lunacy, at Albany, for an engine, generators, switchboard and motors, feed cable and wiring, steam piping and connections, at the Utica State Hospital.

ALLIS-CHALMERS CHANGES.—Mr. Walter H. Whiteside was elected president of the Allis-Chalmers Company at the directors meeting in Jersey City, succeeding Mr. Benjamin H. Warren. Mr. Henry Woodland, of Milwaukee, succeeds William L. Chalmers as treasurer. Before the directors meeting the stockholders elected Edward D. Adams, Mark T. Cox, Edmund C. Converse, Joseph S. Neafe, and Edwin Reynolds to the board. Mr. Converse has been well known in connection with the National Tube interests of the U. S. Steel Corporation. A biographical sketch of Mr. Whiteside, who has won very rapid promotion, has already appeared in our pages.

JULY ELECTRICAL EXPORTS.—The reports of the Department of Commerce and Labor, of July exports, show up well as to electrical exports. The total export of electrical machinery for the month was $597,483, as compared with $493,372 last year, a gain of $104,111, while the seven months show $4,421,298 as compared with $3,702,021. The exports of electrical instruments and appliances for July were $373,191, as compared with $369,614, and for the seven months were $3,031,313, as compared with $2,428,756. The gain for the month was $3,577, so that a total healthy gain is shown of $107,688.

Financial Intelligence.

THE WEEK IN WALL STREET.—The stock market was irregular, the bullish sentiment, however, being kept in check by the expectation of higher money rates on account of low bank reserves at New York and greater demands from the interior for funds to move the crops. The bank clearings for August, which mark the record, aggregated $40,838,989,760, a total slightly larger than in July, 36 per cent heavier than in August a year ago, and 21 per cent larger than the heretofore record August total of 1902. Clearings at New York City foot up $6,980,764,919, or 50 per cent larger than the record for August last year and 19 per cent in excess of the August, 1903, record. Outside of New York clearings reached an aggregate of $3,858,224,841, a gain of 16.5 per cent over August, 1904, and to this extent the largest total ever recorded. Bank clearings at ninety-four cities for eight months aggregate $92,298,469,997, a gain of 38.9 per cent over last year and of 13 per cent over the record total of 1901. New York City's total exceeded last year by 55.7 per cent and the aggregate outside of the metropolis is 15 per cent larger than ever before. The declining tendencies of the copper market had a bearish influence on Amalgamated Copper, which was one of the active features, selling down to 79⅜, from which price it subsequently had a moderate rally. United States Steel stocks continued to attract attention, sentiment in regard to them being favorably influenced by the continuance of good reports about current conditions in the steel trade. Electric and traction stocks were featureless and business in them was ordinary. The Allis-Chalmers issues and Western Union are the only ones that show gains; all the others of the list declined. Allis-Chalmers common closed at 16⅜, being a net gain of ⅜, and preferred at 57½, a gain of 4½ points. General Electric lost 1 point, closing at 179, and Westinghouse ½, the last quotation being 166. In the railway list, Brooklyn Rapid Transit closed at 66⅝, this being a net loss of 2⅛; Metropolitan Street Railway lost 2¼ points, closing at 126⅝, and Interborough Rapid Transit made a net gain of 2 points, the closing price being 217. Western Union's closing quotation was 94⅜, a gain of ¼ point. Following are the closing quotations of Sept. 12:

NEW YORK

	Sept. 5	Sep. 12		Sept. 5	Sep. 12
Allis-Chalmers Co	15⅝	17⅛	General Electric	180½	179
Allis-Chalmers Co. pfd	54	60	Hudson River Tel.	..	..
American Dist. Tel.	30	30	Interborough Rap. Tran.	219	215¾
American Tel. & Cable	90	92	Mackay Cos.	40¾	40¾
American Tel. & Tel.	138	139	Mackay Cos. pfd.	73¾	74
Brooklyn Rapid Transit	67¼	67⅛	Marconi Tel.	..	..
Electric Boat	30	30	Metropolitan St. Ry.	129½	127
Electric Boat pfd	65	65	N. Y. & N. J. Tel.	..	..
Electric Lead Reduction	..	..	Western Union Tel.	94¼	94
Electric Vehicle	17	19	Westinghouse com.	166	166
Electric Vehicle pfd.	21	23⅛	Westinghouse pfd.	..	..

BOSTON

	Sept. 5	Sept. 12		Sept. 5	Sep. 12
American Tel. & Tel.	141⅛	140¼	Mass. Elec. Ry. pfd.	60	59½
Cumberland Telephone	118	120¼	Mexican Telephone	1⅛	1⅛
Edison Elec. Illum.	253	..	New England Telephone	134	134
General Electric	180	..	Western Tel. & Tel.	*18	*18
Mass. Elec. Ry.	17	15⅛	Western Tel. & Tel. pfd.	98⅛	97

PHILADELPHIA

	Sept. 5	Sep. 12		Sept. 5	Sep. 12
American Railways	53⅛	52⅛	Phila. Electric	8¾	8¾
Elec. Co. of America	11	11	Phila. Rapid Trans.	28¼	28
Elec. Storage Battery	80	85	Phila. Traction	101	..
Elec. Storage Battery pfd.	..	..			

CHICAGO

	Sept. 5	Sep. 12		Sept. 5	Sep. 12
Chicago City Ry.	..	190	National Carbon	61	60
Chicago Edison	..	..	National Carbon pfd.	115½	*115½
Chicago Subway	83¼	..	Union Traction	..	..
Chicago Tel. Co	..	..	Union Traction pfd.	..	..
Metropolitan Elev. com.	24⅛	22⅝			

* Asked.

SAN FRANCISCO GAS AND ELECTRIC.—The official announcements of the details of the proposed merger of the San Francisco Gas & Electric Company and the California Gas & Electric Corporation in a great consolidation of lighting and power interests did not give the names of the Eastern buyers. The fact that they were represented by James Stillman, of the National City Bank of New York, led to the impression that the Standard Oil people were interested. There are strong indications that the General Electric Company has more than a passing interest in the transaction. The San Francisco Gas & Electric Company has been licensee for many years for the Edison Electric three-wire system and apparatus supplied by the General Electric Company. Several millions of dollars' worth of machinery has been purchased during the past few years, and it might be advantageous to the General Electric to have an interest in the big deal. The stocks of the California Gas & Electric Corporation and the San Francisco Gas & Electric Company will be deposited with the Union Trust Company, to be turned over to the new consolidation on payment of the price. It is understood that of the $90 per share to be paid for the San Francisco Gas & Electric Company's stock, $25 a share will be paid in cash and $65 in 5 per cent bonds. These bonds will be secured by the properties of the San Francisco company and the stock of the California corporation. The syndicate of Eastern and California capitalists will pay $4,750,000 in cash for the stock of the companies.

THE NATIONAL LIGHT & IMPROVEMENT COMPANY, having its principal offices in the Bank of Commerce Building, St. Louis, Mo., owns and operates several gas, electric light and street railway companies in the Southwest. The company was organized in May, 1905, with a full-paid capital stock of $2,000,000, and an authorized capital of $10,000,000. The National Light & Improvement Company, in addition to operating properties owned by it, is prepared to finance gas, electric light, street railway and water works properties, and to assist the management of such properties in valuing them for the purpose of issuing bonds, in arranging consolidations and in adding to existing equipment or reconstructing throughout such properties. The list of the officers and directors of the company is as follows: Henry C. Scott, president; S. M. Dodd, vice-president; C. W. Keiner, secretary-treasurer. Directors: Henry C. Scott, president Laclede Power Company, St. Louis; S. M. Dodd, president American Brake Company, St. Louis; Thos. H. West, president St. Louis-Union Trust Company, St. Louis; Geo. L. Edwards, A. G. Edwards & Sons, bankers, St. Louis; C. S. W. Packard, president Pennsylvania Company, Philadelphia; W. Hinckle Smith, E. B. Smith & Co., Philadelphia; Geo. B. Post, Jr., Post & Flagg, New York.

DIVIDENDS.—The directors of the Safety Car Heating & Lighting Company have declared the regular quarterly dividend of 2 per cent and an extra dividend of 2 per cent, payable October 2. This is an increase of one-half of 1 per cent in the extra dividend. A dividend of $1.25 per share on the issued capital stock of the San Francisco Gas & Electric Company has been declared. The United Traction & Electric Company of New Jersey has declared the regular quarterly dividend of 1¼ per cent, payable October 2. J. G. White & Co. (incorporated) have declared the regular quarterly dividend of 1½ per cent on the preferred stock, payable October 2. The Twin City Rapid Transit Company has declared the regular quarterly dividend of 1¾ per cent on the preferred stock, payable October 2. The directors of the Boston & Suburban Electric Company have declared a regular quarterly dividend of 50 cents per share, payable October 15.

ELECTRIC GOLD DREDGING has developed into a large industry, and the San Francisco *Examiner* says that W. P. Hammond and John Hays Hammond have succeeded in bringing about a combination of some of the largest gold-dredging mining companies in Butte and Yuba counties. The company is to be known as the Oreville Dredging Company, Limited, and it is organized with a capital of $4,000,000. London, New York and Boston financiers are interested in the project. The company will control something like 4,000 acres of so-called gold dredger land, where the electrically equipped barges are at work.

THE STREET CAR MERGER.—The syndicate formed to finance the merger of the street car manufacturing companies has virtually acquiesced to the demand of G. Martin Brill, who will be the president of the new company, to provide about $2,000,000 more cash for working capital than was provided by the original plan. In consequence, the syndicate managers will issue a modified plan in about a week. The plan promulgated early in August held in reserve $2,000,000 of 5 per cent bonds out of the total issue of $13,000,000. It is understood that under the new plan this $2,000,000 will be sold at once, the proceeds to be appropriated as working capital. The new company has not yet been incorporated.

General News of the Week

The Telephone.

SANTA MONICA, CAL.—The franchise asked for by the Home Telephone Company, of Ocean Park and Santa Monica was sold to it at auction for $100.

LOS ANGELES, CAL.—The Home Telephone Company has asked the Board of Supervisors for a franchise for a telephone system outside the limits of the city within a radius of eight miles.

SAN LUIS OBISPO, CAL.—An application has been received from R. B. Davis, of Los Angeles, asking that a franchise be granted to him for the installation of an electric lighting and telephone system in the city.

POMONA, CAL.—The city authorities of Pomona are removing the poles of the Pacific States Telephone & Telegraph Company, on account of the latter's failure to secure a franchise. The company claims exemption from the provisions of the Broughton franchise law on the ground that it does an interstate business. A lawsuit is expected.

PARIS, ILL.—The Citizens Mutual Telephone Company is the name of the company consolidating all the trunk lines surrounding Paris.

CHICAGO, ILL.—During the month of August the Chicago Telephone Company added 1,498 more telephones to its list of subscribers. It now has a total of 133,359 instruments in service, a gain of 15,359 since January 1 last.

LOWELL, IND.—The Lowell Telephone Company, with a capital stock of $9,000, has just been incorporated. The directors have not yet been chosen.

INDIANAPOLIS, IND.—The Rev. William Mullendore, who has been manager of the Franklin Telephone Company for the past two years, has sold his interest to Louis Holweg of the New Telephone Company, of Indianapolis. Frank and Victor Smith have also sold the greater part of their interest in the business to Mr. Holweg.

WILMINGTON, IND.—The capital stock of the Luther Telephone Company, of which J. J. Schwartz is president and W. O. Stall secretary, has become inadequate to meet the demands. It has been increased from $5,000 to $20,000 in order that the company may extend its lines in the northern part of the county, and especially in Warren and Clear Creek townships.

HOPE, IND.—It is reported that there will be a telephone war at this place. A company has asked for a franchise and the claim is made that the Central Union Telephone Company is back of it. The Hope independent company already has an exchange in operation. It is believed that the Central Union Company intends to make war on the local independent lines.

MARION, IND.—Oscar Barger, manager of the Converse Telephone Company, has petitioned the Marion Board of Works for a franchise to operate a line from the south side of the city to Fairmount, and also asked permission to operate a line from the central part of the city to the west side, this line to extend to Converse. Previously the Board of Works demanded $1 taxation for each instrument in return for a franchise covering the west route, but the company refused to accept. The new line will be in competition with the Central Union, which now owns the local system.

COLUMBUS, IND.—An effort is being made by the Citizens' Telephone Company of this city to control the telephone situation in this section. Thomas Sheerin, of Indianapolis, son of the late Simon P. Sheerin, and M. F. Hosea, of Columbus, is manager. This company is controlled by the New Long Distance Telephone Company, of Indianapolis. Recently Mr. Sheerin and Mr. Hosea visited Hope, trying to make a deal to purchase the Hope telephone exchange. The Bell people are also trying to get a franchise there, and the local company would be strengthened by this connection with the Citizens' Company. The Citizens' Company is also making efforts to obtain the exchanges at Grammer and Elizabethtown.

SPENCER, IA.—The Western Electric Telephone Company contemplates the expenditure of $50,000 in this vicinity before the first of January.

DUBUQUE, IA.—The Delaware County Telephone Company has purchased the Interstate exchange at this place and it will be moved to the Delaware County exchange.

BOISE, IDA.—The Rocky Mountain Bell Telephone Company has asked for a franchise for the installation of underground wires. Numerous improvements in the present system are also to be inaugurated.

NEWRY, ME.—The Bethel and Newry Telegraph & Telephone Company has been formed with a capital of $5,000, by T. H. Jewett, president, Bethel, Me.

WINDHAM, ME.—The Windham Telephone & Telegraph Company has been formed with a capital of $10,000, by J. Hacker Hall, president, and Hiram C. Hawkes, treasurer.

SPRINGFIELD, MASS.—The New England Telephone Company is preparing to construct a new and improved exchange in this city. It is to be located at the east corner of Worthington Street and Stearns Park, and the company will petition the Board of Aldermen for the privilege of extending the conduits containing its wires from Main through Worthington Street to the new place. The plan is to construct a fireproof building to cost about $200,000 for land, building and a new switchboard.

READING, MICH.—The Reading Telephone Company will make a test of the lockout system for rural lines. The apparatus is now being installed. The experiment will be made on a block of 17 telephones on eight miles of wire.

NORTH ADAMS, MICH.—The North Adams Telephone Company, a co-operative company, has sold to Charles E. Knickerbocker, of North Adams, its switchboard, office furniture, cable and office pole. The company still owns the lines and poles inside the village.

GRAND RAPIDS, MICH.—At a meeting of the board of directors of the Citizens Telephone Company the capital stock of the company was increased from $2,000,000 to $3,000,000. A portion of the added capitalization will be placed on sale, and the proceeds will be used for immediate betterment and extensions.

GRANITE FALLS, MINN.—Work has been commenced on the construction of the Granite Falls Telephone Company's exchange under the supervision of Mr. O'Neil, of Minneapolis. A good number of subscribers have been secured.

FARIBAULT, MINN.—The Northwestern Telephone Company has closed a contract with the Morristown Telephone Company, by which it secures connection with about 85 telephones used by Morristown farmers and merchants. Morristown people can now secure a telephone communication with Faribault at a five-cent rate. The Northwestern has ordered the material and made contracts with 75 farmers about Faribault to install telephones for them, and give them free service in Faribault.

BILLINGS, MONT.—The Billings Mutual Telephone Company will rebuild the line from Billings to Roundup.

GREAT FALLS, MONT.—A petition for a franchise for the operation of a telephone system has been presented to the county commissioners by J. C. Furman, of Augusta.

FAIRFAX, MO.—The Fairfax Telephone Company has increased its capital stock from $18,000 to $24,000.

ST. LOUIS, MO.—The City Register has received a statement of the valuetions placed by the State Board of Equalization on telegraph and telephone properties in St. Louis. The following decreases in valuation were made: Bell Telephone Company, $586,984; Kinloch Telephone Company, $115,150, and the St. Louis and Suburban Railway Company, $10,500. The following are the valuations fixed: Bell Telephone Company, $654,178; American Telephone and Telegraph Company, $7,757; Western Union Telegraph Company, $79,706; Pacific Mutual Telegraph Company, $6,382; Missouri District Telegraph Company, $31,604; United Railways, $16,592,737; St. Louis and East St. Louis Railway, $206,540; St. Louis and Meramec Railway, $335,407; St. Louis and Suburban, $1,580,358.

OMAHA, NEB.—Promoters of a new telephone system in Omaha are planning to go before the general council committee and present their plans for getting into Omaha and once more see if the council can be induced to favor the granting of a franchise.

RALEIGH N. C.—The Rose Hill Telephone Company will build lines through the counties of Duplin, Pender and Sampson and through other sections of the State. The incorporators are James C. Williams and Gabriel H. Robinson.

CAPE MAY, N. J.—City Council, at its monthly meeting, passed to its third and final reading an ordinance requiring the Delaware & Atlantic Telephone Company to place its wires underground, at least 2,000 feet to be so placed within a year.

DANVILLE, OHIO.—The Danville Home Telephone Company has been incorporated with a capital of $5,000.

CLEVELAND, OHIO.—The Springfield-New Carlisle Telephone Company has been organized. The company contemplates the erection of a telephone plant in New Carlisle as soon as a franchise can be obtained.

WOOSTER, OHIO.—The switchboard in the city telephone exchange has again outgrown the service needed in the city, and experts in the employ of the North Electric Company, of Cleveland, have began the work of building a large addition to the board. The board has been carrying 699 lines and is to be increased to 938.

TOLEDO, OHIO.—The Toledo Home Telephone Company has received 20 car loads of conduit for the extension of the telephone conduit system. The consignment embraces 100,000 feet. It is the intention of the company to make a number of extensions this fall, and work will begin as soon as the necessary permits are obtained from council.

COLUMBUS, OHIO.—A deal has been closed at Columbus that is of much importance to Toledo independent telephone interests and involves three independent exchanges in Ohio that at present have connections with the local plant. Frank Beam, of Columbus; D. E. Sapp, of Mount Vernon, and Frank Knapp of Bellevue, managers of the local exchanges in their respective towns, have held a conference with the officers of the Toledo Home Telephone Company. The meeting was arranged for the purpose of securing the assistance of the local people in the financing of a scheme to purchose control of the Norwalk, Monroeville and Bellevue exchanges and prevent them from falling into the hands of the Bell Company.

FORT WORTH, TEX.—The Forth Worth Telephone Company is extending a telephone line across Rosen Heights from east to west and there is to be a general improvement in the system and service.

LOGAN, UTAH.—The Utah Independent Telephone Company is installing its system in this city at an estimated expense of $400,000.

SALT LAKE CITY, UTAH.—The Utah Independent Telephone Company has filed with the County Recorder a trust deed for $3,000,000, covering an issue of bonds for that amount.

SALT LAKE CITY, UTAH.—A deal has been consummated between the Western Union Telegraph Company and the Utah Independent Telephone Company, whereby the latter company will be given the use of the telegraph company's poles between this city and Los Angeles.

PRICE, UTAH.—The Eastern Utah Telephone Company, with a capitalization of $60,000, will be organized here within the next few weeks. The Bell Company will be represented on the new company's board of directors. The new lines will connect with the Bell system and will afford a service with adjoining states.

SALT LAKE CITY, UTAH.—An additional 50-pair cable has been authorized by the directors of the Rocky Mountain Bell Telephone Company, from 12th and South Street to Bingham Junction, to cost $14,000; also an additional circuit from Casper, Wyo., to Rund Hill, Idaho, along the line of extension of the Chicago & Northwestern Railway Company. A cable system for Pocatello has also been authorized at an outlay of $12,000; and three additional copper circuits are being constructed to Bingham from this city. The purchase has been authorized of a new switchboard for the Ogden central station. Nampa is also to have a new switchboard.

PORT ANGELES, WASH.—This city is now connected by long-distance telephone with Dungeness, Sequim, Port Williams and other points in Eastern Clallam County, and with Port Townsend and other Jefferson County points, the lines of the Independent Telephone Company, which has been building in this direction for the past few months, having reached here.

Electric Light and Power.

OPELIKA, ALA.—Improvements are to be made by the Opelika Electric Light Company at a cost of about $220,000.

GILROY, CAL.—Bids will be received until September 18 by the Mayor and Common Council for $11,000 bonds for electric light and power works and an electric lighting system. C. N. Hoover is city clerk.

RIVERSIDE, CAL.—The Mercantile Trust Company, of San Francisco, has bought at foreclosure sale, the Riverside Power Company plant for $199,041. The San Francisco firm guaranteed the local bonds, and was forced to foreclosure. The plant had a thirty-one year contract for lighting the Riverside streets.

SONORA, CAL.—Preliminary work for an electric plant at Kennedy's Lake, to furnish power and light to the bay cities, will be commenced at once. Beach Thompson is the promoter of this project. It is proposed to build dams for catching up all the water of the Stanislaus River and conveying it by means of ditches, flumes, etc., to Sulbets Flats to a point where a drop of 1500 feet can be had, and where the power plant is to be installed.

SAN FRANCISCO, CAL.—The California Gas & Electric Corporation will install two additional 1,000-kw polyphase generators on the South Yuba transmission system, which was acquired from the Van Nordens. It is understood that Westinghouse machines will be ordered. The three power plants now in operation are equipped with Westinghouse apparatus, transmitting power to Sacramento and other cities. There is an unlimited amount of water available for further development on the South Yuba.

FRESNO, CAL.—A deed has been filed with the recorder transferring the property of the San Joaquin Power Company to the San Joaquin Light and Power Company, to enable work to be done with a larger capital than possible under the old company, which was incorporated for $800,000. The new corporation has a capital of $3,000,000. It is understood that no outside capital has been taken in, the expansion being from within. The action was necessary to cover the plans in contemplation for the development of more than 50,000 horse-power for use in the valley.

NORWALK, CONN.—It is stated that the Mayor is to appoint a committee of three to investigate the cost of installing a municipal lighting plant.

KENSINGTON, CONN.—The directors of the Kensington Water Power Company of Kensington have voted to dissolve the corporation and to wind up its affairs. A final dividend of $1,729 has been declared and distributed among the stockholders. The company was organized in 1890 to secure control of the water privileges which were then held by the Anglo-American Electric Company. Recently the Kensington company sold the privileges and rights to the American Paper Goods Company, which had previously operated them under lease. The water company has been financially successful.

MORRISON, ILL.—The Morrison Electric Lighting Company has increased its capital stock from $20,000 to $60,000.

VALPARAISO, IND.—The Valparaiso Lighting Company has been incorporated with a capital stock of $150,000. The directors are Clarence H. Geist, Charles B. Kelsey, H. W. Noble, Edward Clifford and D. S. Davis.

PERU, IND.—A statement for the year ending June 30, 1905, has just been issued by the committee having in charge the municipal lighting plant at this place. The city maintains 130 lamps at an average cost of $26 per lamp per year. An expenditure of $30,000, the committee reports, is needed to put the plant in good condition.

LE MARS, IA.—The Gas & Electric Development Company, of Philadelphia and New York, reports the sale of the Le Mars plant. The property was purchased by Mr. Bascom Parker, of Niles, Mich., who assumed control Sept. 1. Extensive improvements will be made.

PITTSFIELD, MASS.—It is reported that the Eaton-Hurlbut Company will construct a $15,000 power plant on South Church Street.

LAWRENCE, MASS.—At the regular monthly meeting of the water board Superintendent Collins was instructed to ascertain the cost of installing and maintaining an electric lighting plant at the pumping station and report at the next meeting.

GRAND RAPIDS, MICH.—The M. B. Wheeler Electric Company has been awarded the contract for installing a lighting plant at Rose City.

SAGINAW, MICH.—The Rifle River Power Company has filed its articles of association. The company is organized to produce electricity for lighting, heat and power. Its plant will be erected on Rifle River in Arenac and Ogemaw counties. The capital stock is $2,000,000, all subscribed, $2,000, paid in. The stockholders are George Silsby, Frank E. Kleinfeld, Alvah E. Kendall and Edwin Stapleton, all of Saginaw.

DELRAY, MICH.—The Solvay Process Company has lighted the village of Delray since its incorporation. Its contract expires next April, and unless some arrangement is made the village will have no lighting system. Delray is to be taken into Detroit and the Edison Illuminating Company has secured a contract with the Solvay Company for illuminating when the contract which compels the latter company to light the village expires.

GRAND RAPIDS, MICH.—A trust mortgage has been filed in Kent, Mecosta and Muskegon Counties, given by the Grand Rapids-Muskegon Water Power Electric Company to the Michigan Trust Company, of Grand Rapids, to secure an issue of bonds running 25 years at 5 per cent. The work of building the dam below Big Rapids is being pushed. The concrete work of the gate section is nearly finished. The company is securing a 66-foot right of way into Grand Rapids for its pole line.

MINNEAPOLIS, MINN.—Bids will probably soon be asked for furnishing the city 1,000 electric lights.

HELENA, MONT.—The Helena Power Transmission Company has awarded the first of a series of contracts, aggregating $1,500,000, for the building of a dam across the Missouri River near here to the Wisconsin Bridge Company, of Milwaukee. It is expected that the company will begin the transmission of electric power to Helena, Butte and Anaconda within ten months. About 20,000 horsepower will be developed, and this will be utilized chiefly in the Amalgamated smelters at Anaconda and in mining at points between there and Helena, as well as for lighting and street car purposes in the cities mentioned. The entire product of the present dam is used in the Helena smelters and Butte mines.

ST. LOUIS, MO.—The General Fuel & Illuminating Company, of St. Louis, has filed a statement showing that it has increased its capital stock from $60,000 to $70,000, all the increase paid.

SIKESTON, MO.—The Sikeston Ice, Light & Power Company has filed letters of incorporation with a capital stock of $25,000, one-half paid. The incorporators are Charles D. Matthews, Jr., Edward C. Matthews, Joseph E. Armstrong, Reese B. Boyce and J. Handy Moore.

ST. LOUIS, MO.—Paul D. Cable, president of the General Service & Development Company, announces that he has purchased from the West St. Louis Water & Light Company the lighting franchise obtained by it from St. Louis County Court several years ago, together with all its physical properties. If his plans are developed in full, farming by electric light may be witnessed in St. Louis County within the near future. He intends to light all the main country roads and wires will be strung into the farmhouses, stables or fields, if so desired by the residents along the route. The franchise is a comprehensive one, giving to the owner the privilege to build in any part of the county.

ST. LOUIS, MO.—In a letter that accompanied the Union Electric Company's proposal to illuminate the public buildings south of Washington Avenue, W. M. Powelson, general manager, declared that if the term of the contract were extended from one to ten years, his concern could furnish the energy for 3¼ cents per kilowatt-hour. He recommended that the Board of Public Improvements consider the change. The contracts for lighting public buildings both, north and south of Washington Avenue, were let, the successful bidders being the Laclede Light & Power Company and the Union Electric Company. The former got the contract for the north and the latter for the south district. The Laclede Company's bid was 5½ cents and the Union's 5 cents per kilowatt-hour.

RENO, NEV.—The Reno Power, Light & Water Company and the Washoe Power & Development Company have been secured by the Fleishhacker interests and ruinous competition in the lighting business at Reno prevented. The Hunter Creek Water Company and the Sparks Water Company will be included in the merger. It is understood that a new company will be incorporated that will probably be called the Union Power, Light & Water Company, and capitalized at $2,000,000. The Fleishhackers are heavily interested in the Truckee River General Electric Company, which supplies electric power for the Comstock mines at Virginia City and in the American River Electric Company, with transmission lines from near Placerville to Stockton, Cal.

CLYDE, N. Y.—The Clyde Gas & Electric Company has been incorporated to take over Clyde Gas & Electric Company; capital, $25,000. The directors are: P. W. Summers, Ithaca; G. S. Sheppard, and W. T. Morris, Penn Yan.

NEW YORK, N. Y.—The Suffolk County Lighting Company has been incorporated with a capital of $50,000. The directors of the company are: George MacDonald, Charles A. Hickey and Wm. H. Morgan, all of New York City.

FAYETTEVILLE, N. C.—The board of public works, Fayetteville, has in hand the enlargement of the electric light plant, together with the improvement of several other public utilities.

CONCORD, N. C.—The town of Concord has contracted with the Murray Iron Works, Burlington, Ia., for a 225-hp Corliss engine; with the Allis-Chalmers Company for a 150-kw alternator and with the Adams-Bagnall Company, of Cleveland, for a 50 arc lamps.

CHARLOTTE, N. C.—The Southern Power Company, Charlotte, is making contracts to furnish electric energy to manufacturing plants, and the latest contract is with the Southern Cotton Oil Company at Charlotte, for about 300 horse-power, beginning with the incoming cotton season. The newest development which is at Great Falls on the Catawba River will be completed in 18 months, according to estimate, and there will be available at that point 60,000 horse-power.

READING, OHIO.—Bids will be received until September 25 by the Board of Trustees of Public Affairs, for enlarging the electric light plant.

SPARTANBURG, S. C.—T. D. Ladshaw, of the firm of Ladshaw & Ladshaw, Spartanburg, S. C., is superintending the developing of a hydro-electric transmission on Meherrin River, at Emporia, Va. From 3,000 to 5,000 horsepower will be generated and will be used for operating a cotton mill, city lighting, etc.

WHITNEY, TEX.—Collier Bros., of Whitney, are considering the matter of establishing an electric light plant at that place.

EL PASO, TEX.—W. A. Hawkins, of El Paso, and associates, are considering the matter of erecting electric power plants on the Sacramento River in New Mexico.

GREENVILLE, TEX.—Extensive improvements are to be made to the city electric light and power plant of Greenville. A proposition to sell the city plant to parties who propose to construct an electric street railway system here is being considered.

CHATTANOOGA, TENN.—The plans for the power plant of the Chattanooga-Tennessee River Power Company, which is to construct the lock and dam power plant at Hale's bar on the Tennessee River, have, it is stated, been approved by the War Dept. Bids for the construction will probably soon be asked. John Bogart, New York City, N. Y., is the consulting engineer.

KNOXVILLE, TENN.—The board of directors of the Knoxville Power Company has held its annual meeting. Plans for the proposed power plant to be erected on Little Tennessee River have been discussed. The following officers were elected at the meeting: President, Charles H. Treat, New York City; vice-president, John T. Wilder, Knoxville; secretary, John F. Barry, New York City; assistant secretary, L. M. Parker, Knoxville. The Knoxville Power Company will expend $3,500,000 in building the plant.

READSBORO, VT.—The proposed electric power plant on Deerfield River will cost about $1,000,000. W. S. Morton, Hartford, Conn., is the engineer.

RUTLAND, VT.—The annual meeting of the Rutland City Electric Company has been held. These directors were elected: S. M. Hamill, A. H. Jackson and H. M. Francis, of Schenectady, N. Y.; F. M. Butler and George S. Haley, of Rutland. Mr. Hamill was elected president, Mr. Jackson vice-president, Mr, Francis treasurer, Mr. Butler secretary and Mr. Haley general manager.

LURAY, VA.—The Luray Gas Company intends to erect a power plant at a cost of about $30,000. N. W. Davis is the engineer in charge.

LURAY, VA.—Preliminary surveys have been made for developing the Shenandoah River near Luray, and about 500 horsepower is found available. D. G. Strickler, F. G. Grave and other parties in Luray are interested.

PROSSER, WASH.—The Prosser Falls Land & Power Company has started to build an addition to its dam across the Yakima River at this point, which, it is expected, will prevent a recurrence of the present low water next year. The stream at this point is now flowing but 200 second feet, the smallest in its history, and if the dam had not been put in last year Prosser would now probably be without water works, irrigation or electric lights.

ALLENDE, MEX.—A new electric light and power plant is to be installed at Allende. The organization of the company was promoted by Enrique Guerra, of Ciudad Porfirio Diaz, State of Coahuila.

CITY OF MEXICO, MEX.—Modesto R. Martinez, on behalf of Andres Matienzo, has secured a concession to utilize the waters of Atoyac River in the State of Puebla for power purposes.

CITY OF MEXICO, MEX.—Parties whose names are not stated have applied to the Federal Government for a concession to establish an electric power plant on the San Andres River in the State of Zacatecas.

SALTILLO, MEX.—The Mazapil Copper Company will install an electric light and power plant at its new smelter here. It is said that the Mexican General Electric Company, of the City of Mexico, has the contract for putting in the plant.

LAS BARRAS, MEX.—The Guadalupe de los Reyes Mining Company will install an electric power plant on the Piaxtla River at this place. The electric current will be used to operate the machinery in the mines. The proposed plant will cost about $100,000.

CHILPANCINGO, MEX.—The Belgian syndicate which recently purchased the Jeronimos waterfall, situated on the Pedrenas River, in the State of Guerrero, is preparing to erect a large electric power plant at the fall. The power will be transmitted to cities and mining camps of the State.

MEXICO CITY, MEX.—It is reported that the Mexican Power Company, with an authorized capital of $10,000,000 operating under a New Jersey charter, has been organized and is preparing to utilize the water power of three rivers in the State of Mexico near Toluca. It will furnish electric power to this city, estimated at 90,000 horse-power.

TAMPICO, MEX.—The Luz Electrica de Tuxpam is the name of a company which has been organized at Tuxpam for the purpose of installing and operating a new electric light and power plant. Among those interested in the enterprise are Luis Montoto Carsi, Antonio Alvarez, Manuel Perez, Santos Gonzalez and Felix Costilla, all of Tuxpam.

CITY OF MEXICO, MEX.—The Mexican Light and Power Company will erect 15 station and storage buildings along its power transmission line between the main power plant at Necaxa and the City of Mexico. These stations will be used for the accommodation of the linemen and watchmen who will constantly patrol the line and for the storage of materials.

CITY OF MEXICO, MEX.—It is learned that a strong company is being formed in London and Berlin for the purpose of installing a large electric light and power system in the City of Mexico. It is reported that representatives of those back of the company have been in the City of Mexico securing contracts for the furnishing of power and that enough of these have been secured to insure the financial success of the enterprise. The names of the parties interested have not yet been made public.

The Electric Railway.

MONTGOMERY, ALA.—The North Alabama Railway, Light & Power Company has filed with the secretary of state a notice of its recent incorporation. This company has a capital stock of $100,000, and it is understood that its object is to build an electric railway through Albertville, Boaz, Whiteville, Attalia and Alabama City. The incorporators are: J. G. Elrod, W. A. Elrod, W. M. Coleman, George M. Rains, T. B. McNaron and Boykin and Brindley.

AUBURN, CAL.—At a recent mass meeting resolutions were adopted pledging the citizens of Placer County to secure a right of way for the electric railway which John Martin proposes to build through this county.

MONSON, CONN.—Representatives of the Springfield & Eastern Street Railway have held a conference with the Monson Selectmen concerning a petition which the company has presented, asking for the right to build a street railway from the northern part of Monson to the Worcester & Southbridge Railroad at Fiskdale.

STAMFORD, CONN.—It is expected that on September 8 the Stamford Street Railway Company will be taken over by the Consolidated Railway Company. A special meeting of the stockholders has been called for that date to take action on a proposition to sell the local company's property, franchises and contracts to President Mellen's corporation.

STAFFORD, CONN.—It is possible that work may be begun soon on the trolley line from Willimantic to Stafford Springs via Mansfield and Storrs. The company which holds this franchise has already begun work on the line from Norwich westerly, which it owns. It is understood that the company is practically ready to build and has charters permitting it to carry freight as well as passengers.

STAMFORD, CONN.—It is expected that the Stamford Street Railway Company will be taken over by the Consolidated Railway Company at once. A special meeting of the stockholders has been called to take action on a proposition to sell the local company's property, franchises and contracts to President Mellen's corporation. An offer has been received for the stock and it is probable that the proposition will be accepted.

NEW HAVEN, CONN.—Branford's lighting and water facilities and trolley line have all passed into the control of the Consolidated Railway Company. The price paid for the road is said to have been about par, the payment having been made in the 4 per cent. debentures of the Consolidated Railway Company. The New Haven road thus gets the trolley from East Haven to Branford. It wanted to buy the trolley without the water company or electric lighting system, but that could not be arranged.

BOISE, IDA.—Articles of incorporation of the Boise & Interurban Railway Company have been filed. This company, at the head of which is W. E. Pierce of this city, will build an electric railway from this city to Nampa, Caldwell, Payette and Emmett. The company is capitalized at $5,000,000, of which $206,000 has already been subscribed. The directors are: W. E. Pierce, Edgar Wilson, J. A. Pinney, J. E. Clinton, Jr., L. A. Coate, M. B. Gwin and Alfred Eoff.

MUNCIE, IND.—The Muncie, Hartford City & Fort Wayne Traction Company has passed into the hands of the Fort Wayne & Southwestern, representing the Wildener-Elkins syndicate.

HOPKINSVILLE, KY.—John Feland, attorney for Samuel C. Crawford, and other parties of Memphis, has asked for a franchise to build an electric railway and lighting plant in this city. An ordinance was passed in response to the request ordering the sale of a franchise on Sept. 15.

KALAMAZOO, MICH.—Just as the Michigan Traction Company was installing a new rotary converter for use in emergencies, lightning struck the power house at Augusta, made its way into the converter and burned out 40 coils.

FREDERICK, MD.—The officers of the Frederick and Middleton Electric Railway have announced the sale of the road, which is eight miles in length, to new owners, whose names are withheld for the present.

FREDERICK, MD.—It is asserted that the purchasers of the Frederick & Middletown (Md.) Electric Railway are the promoters of the road projected from Baltimore to Hagerstown, to be known as the Baltimore and Frederick Electric Railway. The necessary financial backing is said to have been secured.

KANSAS CITY, MO.—Hugh A. Holmes, of New York City, announces that the contract has been given for the proposed electric railway from Kansas City to Iola. It is the intention to build a branch into Paola.

KEENE, N. H.—At the annual meeting of the Keene Electric Railroad the following officers were elected: Daniel R. Cole, president; George E. Whiting, of Boston, treasurer; Frank H. Whitcomb, clerk; Daniel R. Cole, George E. Whiting, George A. Litchfield, Thomas T. Robinson, Charles O. Whiting, T. Russell Robinson, John H. Jennings, directors. The treasurer's statement for the year ending July 1st showed that the road had earned a slight amount above its operating expenses and fixed charges.

ALBANY, N. Y.—The Tunesassa & Bradford Railroad Company, of Olean, has been incorporated with a capital of $50,000. Directors: J. B. Wright, D. H. Miller, Kane, Pa.; F. L. Bartlett, Olean.

SYRACUSE, N. Y.—The Syracuse, Lake Shore & Northern Railroad Company, Syracuse, has been formed to operate a street surface electric road fifteen miles long, from Syracuse to Baldwinsville. Capital, $2,250,000. Directors, H. S. Holden, C. M. Warner, A. K. Hiscock, William Nottingham and L. C. Smith, Syracuse.

BUFFALO, N. Y.—W. Caryl Ely, formerly president of the International Railway Company, of Buffalo, and president of the American Street Railway Association, has secured options on the electric railways of East Liverpool, Wellsville and Rock Springs, Ohio, and Chester, W. Va., together with the electric lighting plants of all these places. The East Liverpool system on which Mr. Ely has secured an option has the right to construct an additional line from Wellsville to Steubenville, Ohio. Along with the other options

secured are an application for a charter for a new line from East Liverpool to Beaver, Pa., and a summer park at Chester. In the event of their purchase Mr. Ely will combine them all into one company. The unification of the lines that will necessarily follow their absorption will call for the expenditure of a large amount of money for improvements.

PINEHURST, N. C.—The trolley line from Southern Pines to Pinehurst has been sold to the Page Railroad and will be discontinued.

OBERLIN, OHIO.—The Oberlin & Lorain Street Railway seems to be an assured fact.

LISBON, OHIO.—Another railway enterprise, having for its object the construction of an electric road from this city to East Liverpool, is in the field.

CINCINNATI, OHIO.—The Cincinnati Northern Traction Company has secured a site at Lindenwald, near Hamilton, for its proposed new power station. This will be one of the finest interurban stations in the country and it will cost in the neighborhood of $700,000.

CINCINNATI, OHIO.—The Cincinnati, Lawrenceburg & Aurora Traction Company is planning to build an extension from Harrison, O., to Batesville, Ind., there to connect with the Indianapolis & Southeastern Traction Company, which will build from Shelbyville to Batesville. The road will not be built this year, however.

TOLEDO, OHIO.—The Patrick Hirsch Company has closed all contracts for the building and equipping of the Toledo, Ann Arbor & Detroit Railway. The Arbuckle-Ryan Company, of Toledo, has secured the contract for the steam equipment and piping; the General Electric Company will furnish the electrical equipment, and the Niles Car & Manufacturing Company the cars. The Carnegie Steel Company is making shipments of rails. Ground has been broken for the power station at Petersburg, Mich.

CLEVELAND, OHIO.—Governor Myron T. Herrick, who is prominently identified with some of the traction interests of Ohio, will use the electric railway almost exclusively in his campaign for re-election this fall. Arrangements have been made with the manager of practically every electric railway in the State to handle the Governor's special car. Over two-thirds of the county seats and hundreds of small towns are accessible by electric railway. An ordinary trolley car will be used. The seats will be removed and tables and chairs substituted.

SPRINGFIELD, OHIO.—S. L. Johnson, of New York, is said to be organizing a syndicate for the purpose of acquiring the bankrupt Springfield & South Charleston line and carrying out the original plan of extending it to Washington C. H. and Chillicothe.

PAULDING, OHIO.—The Westinghouse Electric & Manufacturing Company is reported to be preparing plans and estimates for an electric railway from Wauseon through Napoleon and Defiance to Paulding. The project is said to be backed by the Patrick Hirsch Company, of Toledo.

LIMA, OHIO.—It is announced that arrangements have been completed for refinancing the Sandusky Southwestern Traction Company, which has been in the hands of the receivers for some time. It is stated that Percy Dickinson and John R. Lowther, of New York, representing bankers in that city, have agreed to pay off the debts, raise the receivership and subscribe for $2,000,000 of bonds to complete the line between Kenton, Lima and Bellefontaine.

PITTSBURG, PA.—President Frank G. Patterson, of the Southern Traction Company, has announced that within a month a contract will be awarded for the construction of 18 miles of road.

YORK, PA.—The York County Traction Company, through its subsidiary companies, has secured the rights to build an extension from Red Lion to McCall's Ferry; also from Hanover to New Oxford, in Adams County.

COLUMBIA, S. C.—The Hyatt Improvement Company proposes to build an electric street car line developing suburban property, F. S. Hyatt being among those interested.

COOPER, TEX.—It is proposed to build a street railway line in Cooper. Dr. Joe Blackwell can give information.

BROWNWOOD, TEX.—A project is on foot to build an interurban electric railway between Brownwood and Rising Star. The promoters of the project have had estimates made on the cost of constructing the line.

WAXAHACHIE, TEX.—A syndicate of Eastern capitalists have been investigating the situation with the view of constructing an interurban electric railway between Waxahachie and Ennis. The distance is about ten miles.

CORSICANA, TEX.—J. V. Watkins, of Corsicana, is promoting the building of an electric railway between this place and Palestine. Application will be made to the City Councils of the two towns for franchises over their streets.

MINERAL WELLS, TEX.—J. D. Beardsley, of Gibsland, La., is working on the project of building an interurban electric railway between Mineral Wells and Fort Worth. The distance is sixty miles and the cost of construction is estimated at $1,500,000.

BRYAN, TEX.—A large part of the capital stock of the company that is being organized to construct an electric railway line between Bryan and College Station, where the State Agricultural and Mechanical College is situated, has been subscribed. Ed. Hall, A. M. Waldrop, James H. Webb and others are interested.

SALT LAKE CITY, UTAH.—An amendment to its articles of incorporation has been filed with the county clerk by the Salt Lake & Ogden Railway Company, by which the capital stock of the company is increased from $800,000 to $1,500,000. At present the company is operating a steam railroad, but this is to be converted into an electric line with a double track. Arrangements have already been made for a bond issue, to be negotiated through a New York firm.

SHEBOYGAN, WIS.—The Sheboygan Light, Power & Railway Company is figuring on plans for extensions and new suburban lines.

JANESVILLE, WIS.—It is reported that J. Nutt, of Cleveland, acting in the interests of Farson, Leach & Company, has secured an option on 10,000 shares of the Rockford, Beloit & Janesville Interurban Company and that a deal is likely to be closed which will transfer the controlling interest in the enterprise to Chicago parties. The buyers' purpose is said to be consolidate the Interstate line with Freeport and Belvidere. Madison traction interests, it is said, will also come in.

MONTEREY, MEX.—It is stated that the Canadian syndicate which recently purchased the two railway system of Monterey, paid $550,000 for the Empresa system and $360,000 for the Slayden lines. Steps have already been taken toward merging the two systems and converting them into electric lines.

BACA, MEX.—The Cigarrere Mining Company is preparing to build an electric railway from its mines to Baca Station, where connection will be made with the Mexican Central Railroad. The line will be four miles long. L. Iwansky, of Parral, Mexico, can give information in regard to the project.

CITY OF MEXICO, MEX.—An important concession has just been granted the Mexico Electric Tramways, Ltd., by the Mexican Government for the construction of additional lines of railway in the City of Mexico. The new lines are to be built for the most part in what is known as the Santa Maria quarter of the city. The period of the concession expires February 24, 1982.

GUADALAJARA, MEX.—The stockholders of La Electra Company of Guadalajara have authorized the issuance of $2,000,000 in mortgage bonds for the purpose of providing funds for the construction of the electric street railway system in Guadalajara. The bonds will be issued in blocks of $500,000 and will be taken, it is stated, by banks in this city. By the purchase of the Kunhardt lines, which were acquired recently for $500,000, La Electra secured control of the street railway situation in Guadalajara. The new power house that the company will build in connection with the electric system wil cost $500,000. It will be located a short distance from the falls of the Santiago River, at Juanacatlan, and will generate 7,000 horse-power. The cost of the street railway system and the new power house will be between $2,500,000 and $3,000,000.

New Industrial Companies.

THE ACME ELECTRIC COMPANY, of Knoxville, Tenn., has been formed by H. M. Moses and Lewis Self, to do a general electric business.

THE EGAN ELECTRIC COMPANY has been organized at Dallas, Tex., with a capital stock of $15,000. Its purpose is to deal in electrical fixtures and supplies. G. H. Egan is one of the incorporators.

THE MEXICAN ELECTRICAL CONTRACTING COMPANY has been organized at Guadalajara, Mex., for the purpose of importing and installing electrical machinery. E. W. D. Cummings is interested.

The LOWELL & FITCHBURG ELECTRIC COMPANY, of Lowell, Mass., has been incorporated in Boston with a capital of $400,000. Albert E. Knowlton is treasurer and the directors are Thomas H. Hathaway and Charles N. Goodrich.

THE ELECTRIC FLOOR SURFACES COMPANY, of Gardiner, Me., has been incorporated to manufacture machinery, etc. The capital is $200,000. J. S. Maxcy, of Gardiner, is president; G. F. Hall, of Providence, treasurer.

THE TIFFANY ELECTRIC MANUFACTURING COMPANY, of Portland, Me., has been incorporated with a capital of $1,300,000. The officers are: President, C. O. Barrows, of Portland; treasurer, W. M. Payson, of Boston.

THE WOOLLEY ELECTRIC COMPANY, of Clayton, Mo., has been organized to manufacture electrical supplies. The capital stock is $25,000, Walton D. Woolley, of St. Louis, and E. C. Hencken and Fred Essen, of Clayton, being stockholders.

Legal.

ATLANTIC TELEPHONE.—An injunction has been asked for against the Atlantic Telephone Company to restrain it from transferring stock upon its books or increasing its capital stock until the trial of an action brought by D. A. Reynolds for the fulfilment of an agreement alleged to have been made in 1901, under which the officers were to have issued to him $49,993 of its capital stock. The Atlantic Telephone Company recently applied for a franchise to do a telephone business in New York City as an "independent" system.

Obituary.

MR. H. W. EATON.—Harry W. Eaton, assistant treasurer of the Houghton County Electric Light Company, of Houghton, Mich., was drowned on a fishing trip on Lake Superior. He was out with Alton W. Leonard, manager of the company, and Engineer Nelson, both former Brocktonians, and one other man. In some way he fell from the launch into the ice cold waters of the lake. He shouted to have the launch put out to him, but there was a momentary delay, of course, and he sank before any assistance could reach him. Mr. Eaton was formerly an auditor for Stone & Webster.

W. B. GILL.—William B. Gill, formerly a district superintendent of the Western Union Telegraph Company, with headquarters in Philadelphia, died September 6th, at the age of 59 years. Mr. Gill entered the employ of the Western Union Company as a messenger boy, and eventually became superintendent of the sixth district, which embraces eastern Pennsylvania, the southern section of New Jersey, Delaware, and a part of Maryland and Virginia. He retired in 1902. He was president and general manager of the Philadelphia Local Telegraph Company, a director in several other companies, and at one time a vice-president of the Bell Telephone Company.

Personal.

W. S. DORAN.

MR. W. S. DORAN, formerly associated with the British Westinghouse and Manufacturing Company, Ltd., has just been appointed manager of the power department of Allis-Chalmers Company, in which capacity he will have complete charge of the company's commercial affairs pertaining to reciprocating steam engines, steam and hydraulic turbines, condensers, gas engines, blowing engines for iron and steel blast furnace service and rolling mill engines, with headquarters at Milwaukee, Wis. Mr. Doran is excellently qualified to carry on this large and important work. He brings with him not only the knowledge acquired in some of the largest manufacturing concerns in this country, but also the wide scope of technical training gained during the many years he has spent abroad. He started on his business career with the Southwark Foundry & Machine Company, Philadelphia, where he remained for five years engaged in drafting and general shop work. After spending some time with the United Gas Improvement Company, of Philadelphia, in the construction and management of water-gas plants for that company, he became connected with Henry R. Worthington, with whom he remained for many years in New York, Chicago and Philadelphia. In addition to his engineering duties, he had charge of the branch offices, and while located at Chicago had complete charge of their entire western business. In 1899 he joined the Worthington headquarters in London, England, where he took charge of the various branch offices and important negotiations in Great Britain and Ireland. In 1901, he became associated with the Westinghouse interests, and since then has been establishing their branch offices and supervising sales. In that capacity, he has conducted a large number of important negotiations successfully with steam railway companies, power distribution companies and street railwy lines. As an evidence of the high esteem with which Mr. Doran is regarded by his business associates, a banquet was given him on the eve of his departure from England, attended by many well-known railway officials, manufacturers, electrical engineers and representatives from practically all the large electrical manufacturing concerns in England.

MR. GEORGE WESTINGHOUSE has returned from Europe this week by the "Kaiser Wilhelm."

MR. JOHNS HAYS KUHNS, who for some years has practiced electrical engineering throughout the West, with headquarters at Omaha, Neb., has sailed for Japan to accept a position under the Japanese Government.

MR. J. E. SCOTT, manager of the Bell telephone exchange at Zanesville, O., has been made traveling auditor with supervision of some twenty exchanges in the fourteen counties of the Columbus district. He is succeeded by Mr. P. R. Brehmer, chief inspector.

MR. H. F. STRATTON, who has been connected with the principal office of the Electrical Controller and Supply Company, at Cleveland, O., has accepted the position of New York representative of the same company, with offices at 136 Liberty Street, New York City.

MR. GEORGE P. LOW, founder of *The Journal of Electricity, Power and Gas,* San Francisco, who has occupied the editorial chair for the greater part of the time, retired August 31. He was elected president of the Pacific Coast Electric Transmission Association at its recent annual meeting.

MR. A. W. LEONARD.—Mr. Alton W. Leonard, former manager of the Brockton (Mass.) Edison Electric Illuminating Company, and more recently manager of the Houghton Electric Light Company in Houghton, Mich., and also of one of Stone & Webster's electric railway enterprises there, has been further promoted by the Stone & Webster management, and has been named as manager of the General Electric Company in Minneapolis.

MR. F. E. VALENTINE, the newly elected president of the Ohio Electric Light Association, whose annual convention has just been reported in these pages, is secretary and manager of the Miami Light, Heat and Power Company, of Piqua, Ohio, one of the progressive concerns of that State. His election to the office of president of the association for the current year is in recognition of the active part he has taken in furthering its interests in every way. He has always taken a prominent part in discussions at conventions and has been active in committee work between conventions. At the last convention he headed the written discussion on meter and billing records.

MR. JAMES C. HAIN has resigned as engineer of masonry construction for the Chicago, Milwaukee & St. Paul Railroad and is now associated with J. G. White & Company as superintendent of masonry construction, with headquarters at 43 Exchange Place, New York. Mr. Hain graduated in 1893 from the University of Wisconsin with the degree of B. S. in C. E. The University conferred upon him the degree of C. E. in June, 1905. Mr. Hain was with the Chicago, Milwaukee and St. Paul Railroad for ten years and in that time gained a broad experience in the work which is supervised by its bridge and building department. While with this company he also had experience in general design and in detail computation and drawing. He also performed outside duties of surveying, collecting data and other work relative to replacing wooden bridges and other temporary structures with permanent masonry construction. During the year 1900-1 he was in charge of the construction of the large ore dock and approaches at Escanaba, Mich. In 1901 Mr. Hain was appointed engineer of masonry construction and in that capacity supervised all work of this nature that has been done during the last four years by the Chicago, Milwaukee and St. Paul Railroad on its 7,000 mile system.

Trade Publications.

LIGHTING SPECIALTIES.—Harvey Hubbel, Bridgeport, Conn., has issued circulars illustrating sockets, attachment-plugs, clusters and metal reflectors. A full supply of samples is kept on hand at the New York office, 229 Broadway.

A GOOD RULE has been sent out by the American Platinum Works, of Newark, N. J., as an advertisement. It has a brass edge, is 15 inches long, finished in black enamel, with the name of the company on both sides. It is of attractive utility for the desk.

ELECTROMAGNETS.—Charles R. Underhill, 55 Liberty Street, New York, has recently issued a sheet with thirty-five cuts, showing the various types of electromagnets, alternating and direct-current. This, together with booklet, "Facts about Electromagnets," will be sent free to any address.

ROSETTES.—Pass & Seymour, Solvay, N. Y., has issued a circular describing fuseless rosettes, attachment plugs and weather-proof sockets. Accompanying the circular is a letter which serves to show that the company is making some special prices upon these goods, both in small lots and in standard cases of 250.

THOMPSON-RYAN DYNAMOS.—The Ridgeway Dynamo & Engine Company, Ridgeway, Pa., has issued bulletin No. 16, giving a list of customers who have in use Thompson-Ryan dynamos and McEwen engines, in order that prospective purchasers may learn to whom to apply for accurate knowledge concerning the service rendered by these machines.

A RIDE ON LAKE ERIE.—An enjoyable ride is that on Lake Erie between Detroit and Buffalo. The Detroit and Buffalo Steamboat Company, Detroit, Mich., runs a line of steamers between these cities, and the trip at this time of the year affords an opportunity to see the famous lake at its best. The company publishes a pamphlet which tells all about the trip.

MOTOR CONTROLLERS.—The Ward Leonard Electric Company, Bronxville, N. Y., has recently issued a number of leaflets devoted to motor controlling apparatus. The SKE type of motor starter is described as being entirely fool-proof. It is impossible to start the motor under the condition of weakened field. When the voltage is removed from the line, the starting arm carries the handle of the field rheostat back to the position of "all resistance out."

RUBBER GOODS.—The Peerless Rubber Manufacturing Company, 16 Warren Street, New York, has issued a well-illustrated 137-page catalogue, designated as No. 70, dealing with all kinds of rubber goods for industrial purposes. Descriptions are given of sheet packing, sectional gaskets, valve and rod packing, belting, steam and water hose, rubber matting and rubber tiling. The catalogue is printed in colors, which serve especially to show the beauty of the various designs of the tiling.

HOISTING AND CONVEYING MACHINERY.—In bulletin No. 12 of the Robins Conveying Belt Company, Park Row Building, New York, are described in detail the manufacture, erection and operation of hoisting and conveying machinery for power stations. Views are given of the coal-handling equipment in the power station of the New York Subway at 58th Street and 12th Avenue; in the power plant of the Richmond Heat, Light & Power Company, Staten Island, N. Y.; in the coal yards of the Brooklyn Heights Railroad Company; in the new plant of the Edison Electric Illuminating Company, of Boston, and in the Kingsbridge power plant of the Metropolitan Street Railway Company, of New York.

MOVING AIR.—The problems involved in the transportation or movement of fluids differ essentially from those concerned with the conveyance of solid materials. In the case of the latter the process is one of actual carrying, while in the former the movement results from, and is proportional to, the pressure difference existing between the delivery and receiving points. The solid is actually carried in bulk, while the fluid, as its name suggests, merely flows toward the point of least resistance. In other words, the transportation of fluids, of which air and water are the most familiar and plentiful examples, results from the creation of a difference in pressure. A portable receptacle is usually required for the latter, while a conduit is necessary for the passage of the former. A very comprehensive discussion of the subject is presented in the exhaustive treatise on "Mechanical Draft," published by the B. F. Sturtevant Co., of Boston, Mass.

News of the Trade

NERNST LAMP AGENCY.—Mr. Arthur F. Salomon, with offices at 519 Mission Street, San Francisco, Cal., is now general agent for the Pacific Coast for the Nernst Lamp Company, of Pittsburg.

THE AMERICAN COIL COMPANY, West Somerville, Mass., manufacturer of ignition apparatus, sparking plugs, induction coils and other electrical apparatus for automobiles, etc., is to remove to Foxboro, Mass., where a new factory will be erected, 25 x 45 ft. and two stories.

GREGORY ELECTRIC COMPANY.—Owing to constant increase in its business the Gregory Electric Company is again compelled to enlarge its works at 16th and Lincoln Streets, Chicago, and has just begun building an addition which will practically double the size of the present warehouse. The addition is expected to be completed by March 1, 1906.

MR. T. J. COPE, 3244 N. 15th St., Philadelphia, the well-known expert in conduit work and manufacturer of conduit specialties, is on a trip through the West, and will visit a number of cities, including Kansas City and Denver, before his return. Mr. Cope's line of underground specialties is the direct result of his long and successful experience in this kind of work, and comprises conduit rods, cable racks and special machinery for handling and installing cables and wires. Recently increased manufacturing facilities make it possible to handle all orders promptly.

Weekly Record of Electrical Patents.

UNITED STATES PATENTS ISSUED SEPT. 5, 1905.

[Conducted by Rosenbaum & Stockbridge, Patent Attys., 140 Nassau St., N. Y.]

798,589. RESISTANCE DEVICE; George Baehr, McKeesport, Pa. App. filed Sept. 28, 1904. Relates to a construction of resistance unit in which parallel side frames have connecting bolts upon which are hung the usual serpentine resistance conductors which the current is made to traverse in series. The side frames have hooks by which they can be hung on a panel board.

798,602. AUTOMATIC CARRIER FOR ELECTRIC WIRES; Frank E. Detchon, Delta, Col. App. filed Aug. 4, 1904. A reel-carrying carriage has propelling wheels with spring motors by which the carriage is propelled along a guide wire. As the carriage moves the wire to be hung is payed out from the reel.

798,606. MACHINE FOR INSULATING ELECTRICAL CONDUCTORS; Charles H. Hawkins, Long Island City, N. Y. App. filed Nov. 28, 1904. A spirally grooved drum rotates continuously within a casing having a conical end so that the rubber or insulating material is compressed toward such conical end. The material is made to traverse diametrically opposite openings so as to be formed into two tapes or shreds. These wrap around the wire as the latter rotates so as to insulate the same.

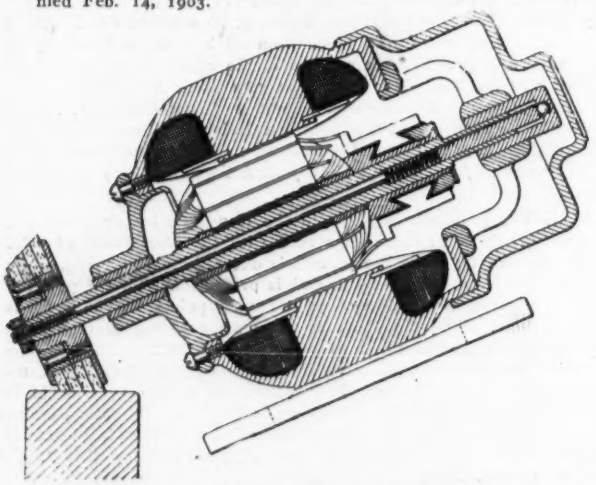
798,659. ANNUNCIATOR; Charles C. Cadden and James I. Gemmill, Cleveland, Ohio. App. filed June 11, 1903. An annunciator for the purpose of indicating a call is combined with a spring jack upon the switchboard. As the spring jack is inserted it moves a small lever which is effective to restore the usual shutter of the annunciator to normal position automatically.

798,671. AUTOMATIC TELEGRAPH; Alfred C. Gilmore, Chicago, Ill. App. filed Mar. 10, 1903. A printing telegraph which is designed to select the proper printing character automatically by means of selecting devices controlled by the usual dot and dash signal. For this purpose the type wheel is stepped around by different electro-magnets, some of which respond to dots and some to dashes so that the proper character is positioned for any combination.

798,673. TROLLEY; Robert G. Griswold and Charles C. Willits, Quincy, Mass. App. filed Oct. 13, 1903. The trolley harp is capable of movement independently of the pole and is spring-pressed to move the wheel upward, whenever the latter leaves the wire. Under these circumstances the relative movement is effective to project upward a pair of horns which assist in repositioning the wheel.

798,691. TROLLEY FINDER; Jerry Morrow, Wellston, O. App. filed July 6, 1904. Relates to modifications of the above and particularly to the construction of the horns or projections which replace the wheel. In this patent these are made integral with a bail or loop which strengthens the construction.

798,720. TELEPHONE-REPEATER; David H. Wilson, Chicago, Ill. App. filed Feb. 14, 1903.



798,770.—Governor for Dynamos.

798,742. AUTOMATIC TRAIN SIGNAL; Clay H. Martin, Jackson, Mich. App. filed Dec. 20, 1904. In order to give sufficient notice to all persons in case a freight train parts at an intermediate point, a flexible cord is run along the top of the train from the caboose to a point near the engine. When the train parts, the tension in the cord causes flash powder to be ignited near the engine and an alarm circuit to be run within the caboose.

798,747. ELECTRIC HEATER; Frank O'Hanlon and Joseph F. Kelly, Philadelphia, Pa., and Henry S. Vautier, Camden, N. J. App. filed Sept. 6, 1904. A water heater in which the heating coils are inclosed within an interior drum or cylinder which may be removed whenever desired from its surrounding casing through which the water circulates. The object is to facilitate repair.

798,748. CONDUIT FOR ELECTRICAL CONDUCTORS; William C. Robinson, Allegheny, Pa. App. filed Oct. 5, 1904. A strip of sheet-metal is bent to form a pair of parallel tubes with an intermediate connecting web. The tube serves to contain and protect the electric conductors while the web serves as a means for fastening the whole to a wall or a side of a building.

798,770. GOVERNOR FOR DYNAMOS; Charles A. Eck, Newark, N. J. App. filed Aug. 12, 1903. A magneto for gas engines in which the armature spindle is inclined to the fly-wheel so that its pulley is held in contact therewith by gravity. Under excessive speed the field becomes strong enough to lift the armature spindle away from the fly-wheel.

798,784. CONTROL OF APPARATUS GOVERNING THE PASSAGE OF CARS ALONG RAILWAYS. Henry W. Griffin, New York, N. Y. App. filed Apr. 1, 1905. A slugishly moving relay is set in motion by the passage of a train. If the speed of the train is so high as to pass a succeeding rail joint before the sluggish relay has had time to act, a train stop is effected. The object is to permit a train to run by a caution signal at slow speed.

798,790. ELECTROLYTIC PROCESS; Carl Hering, Philadelphia, Pa. App. filed July 13, 1901.

798,803. POCKET ELECTRIC BURGLAR ALARM; Herman A. Kreh, New Orleans, La. App. filed Dec. 30, 1904. A pair of spring arms may be inserted within the usual crevice of a window so that when the latter is opened the arms will separate and close the alarm circuit.

798,826. REGULATOR; Alphonse F. Pieper, Rochester, N. Y. App. filed Aug. 29, 1903. An arrangement for regulating alternating current motors, including a series of choke coils all in shunt with the armature circuit and a switch by which a greater or less number of choke coils are made effective.

798,838. TELEPHONE-EXCHANGE SYSTEM; Ernest Hugo Strauss, Chicago, Ill. App. filed Aug. 29, 1903.

798,906. STORAGE BATTERY; Alfred E. Knight, Somerville, Mass. App. filed Nov. 16, 1904.

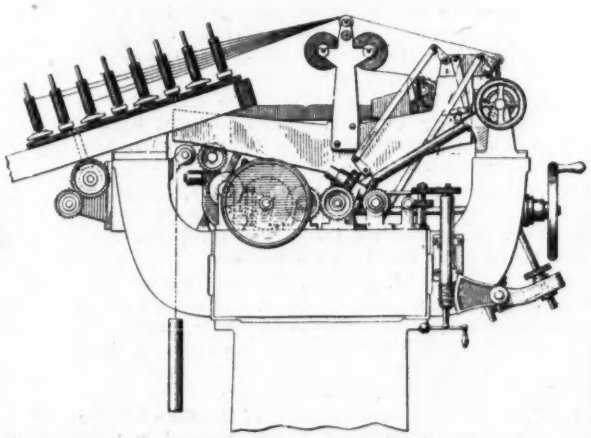
798,915. ELECTRIC SWITCH; McGonigle Miller, Louisville, Ky. App. filed Sept. 30, 1904. A device for actuating a switch intermittently comprising a solenoid having a core which is drawn into the solenoid and subsequently released in the usual manner of reciprocating motors. The core has a pawl which steps around a ratchet wheel which in turn operates the intermittent switch.

798,920. METHOD OF REDUCING OXALIC ACID AND ITS DERIVATIVES BY ELECTROLYSIS; Emil von Portheim, Prague, Austria-Hungary. App. filed Jan. 29, 1904.

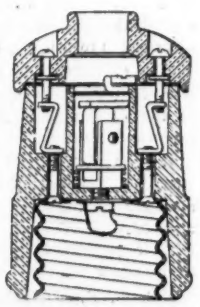
798,932. ELECTRIC LAMP SOCKET; George B. Thomas, Bridgeport, Conn. App. filed Mar. 6, 1905. A porcelain socket having a lamp holding part with the usual threaded shell contained in a cavity and a head which is secured to the first-named part by a sort of flexible bolt. A central chamber within the socket contains the usual switch terminals.

798,933. AUTOMATIC LETTER BOX ALARM; Chalmer D. Tucker, Oxford Junction, Ia. App. filed Jan. 13, 1905. An apparatus for ringing an alarm circuit whenever a letter box is opened to deposit mail. The box can be opened at any time when desired to remove the mail without operating the alarm circuit by pressing a detent which makes the signal closing means inoperative.

798,954. ELECTRIC INCANDESCENT ILLUMINATING APPARATUS; Gerald B. Francis, Woking, Eng. App. filed Dec. 17, 1904. In order to apparently increase the area of the illuminating surface in an incandescent lamp, the filament is mounted on a rotating spindle driven by a small motor, causing it to generate a solid of revolution which apparently constitutes the illuminating surface.



798,864.—Automatic Winding Machine.



798,932.—Electric Lamp Socket.

798,864. AUTOMATIC WINDING MACHINE; James C. Anderson, Jersey City, N. J. App. filed July 16, 1904. A machine for winding material in the form of fibres, filaments, strands or strips into coils, bobbins, etc., and for introducing sheet material, such as paper for insulating the successive windings. The invention is an improvement on an earlier machine which winds bare wire with a separating fibre, but in the present machine ordinary insulated wire is also used. A purality of bobbins can be wound simultaneously. The machine is under control from a single lever.

798,975. ELECTROMAGNETIC POWER GENERATOR; Joseph L. Potter, Indianapolis, Ind. App. filed Apr. 3, 1905. A toy motor comprising a casing having an open end to contain a dry battery and a fly-wheel with a connecting rod reciprocated by an electro-magnet.

799,010. TELEPHONE SYSTEM; Oscar M. Leich, Chicago, Ill. App. filed Feb. 9, 1900.

799,016. ELECTRIC BELL OR LIKE DEVICE; Carl J. Schwarze, Adrian, Mich. App. filed May 31, 1904. Details of construction of a telephone bell relating particularly to the arrangement of the magnets. These are formed of coils secured to L-shaped parts which form the pole pieces of each magnet. The armature is formed by a centrally pivoted lever which is alternately attracted at its respective ends.

798,017. ELECTRIC BELL; Carl J. Schwarze, Adrian, Mich. App. filed Sept. 19, 1904. Relates to modifications of the above and particularly the form of the surrounding casing which includes the two bells and an inermediate cup containing the operating parts. A shield is provided for the hammer.

799,019. TELEPHONE-SWITCH; Michael Setter, Chicago, Ill. App. filed Sept. 13, 1902.